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AMERICAN SEWER DESIGN AND CONSTRUCTION*

With Special Reference to the Metropolitan Main Drainage Works,
Boston, Mass.

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BOSTON CITY SEWERAGE

THE circumstances which led up to the construction of the Boston Main Drainage Works—distinguishing these from the metropolitan works to be referred to hereafter—were commonplace enough. It is on record that, in 1870, an aggregation of old city sewers discharged by about seventy outlets into tidewater, chiefly along the harbor front, with the customary results. In 1875 the problem was submitted to a commission of medical and engineering experts, who were asked to report as to the best means of providing main drainage facilities for the entire area of the city, having at that date a population of about 340,000, and occupying an area of $37\frac{1}{2}$ square miles. A further area in the Charles and Neponset river valleys, naturally tributary to any system of this character, was also included in the reference, and it was ultimately decided to deal with a total of fifty-eight square miles lying to the south of the Charles river. The East Boston and Charlestown areas of Boston, $3\frac{1}{2}$ square miles in extent, lying north of the Charles river, did not fall within this division of the project. The more thickly settled portions of the city itself obviously demanded preference in any remedial measures to be undertaken, and the physical features of the territory greatly favored the claim. These districts form part of a low-lying area of about twelve square miles, whose highest elevations are not more than forty feet above mean low water, and requiring, on that account, the installation of pumping plant for its effective drainage. The remaining forty-six square miles, it was found, could be most advantageously drained by a high-level sewer discharging by gravity into the harbor. It is to be understood, however, that the sewage from a

considerable portion of this area, including sections of Newton, Brookline, etc., would require to be pumped into this sewer, the remaining portions of these cities and towns being drained directly into it.

In view of these conditions, it was decided to proceed at once with the construction of the low-level system and to postpone the building of the high-level gravity sewer until such time as the increasing density of population, and other causes, should call for action in that direction. It was foreseen, however, that this necessity might arise in certain parts of the higher area before the period when the building of the high-level sewer should have become imperative, and provision was consequently made for an addition of three square miles to the low-level district, making its total extent fifteen square miles, and upon this basis the intercepting sewers and pumping station were designed and carried out. The harbor outfall works, on the other hand, were made of sufficient capacity to receive, in addition, the sewage of the entire high-level district, and an inlet for this purpose was provided at Squantum.

The original works of the low-level system—known as the Boston Improved Sewerage—were constructed between 1877 and 1884 at a cost of \$5,000,000. They comprised twenty-five miles of main and intercepting sewers, ranging from $2\frac{1}{2}$ feet to $10\frac{1}{2}$ feet in diameter, located generally along the tidal margins of the city and lying mainly below the level of low tide; a pumping station at Old Harbor Point, where the sewage is lifted about thirty-six feet through force mains into twin deposit sewers, each eight feet wide and sixteen feet high, in which heavy matters settle before the sewage reaches a $7\frac{1}{2}$ -foot tunnel, 7,160 feet in length, crossing under Dorchester Bay; an outfall sewer, eleven feet high and twelve feet wide, 5,900 feet in length, built on an embankment and connecting the tunnel with open reservoirs on Moon Island, where the sewage is stored during the latter half of the ebb tide and the whole of the flood tide; and a discharge conduit leading to the tidal currents in the harbor. The original capacity of the reservoirs was about 24,000,000 gallons, but additions made

* From a paper, by the present Editor of THE MUNICIPAL JOURNAL AND ENGINEER, read by him at the annual meeting of the Incorporated Association of Municipal and County Engineers, held at Shrewsbury, England, July 14-16, 1904. Although originally submitted to a representative English audience, it is believed that this paper will be of interest to American readers, not merely as embodying collected data concerning an important undertaking with which the Author was connected for several years, but also as affording information in regard to American divergences from English practice. It should be noted that capacities and values have in all cases been re-converted from Imperial to U. S. gallons and from sterling to dollars respectively. The high-level system of the Metropolitan works is now in operation.

within the last five years have increased this to 50,000,000 gallons. Similarly, the original pumping plant, with a nominal capacity of 50,000,000 gallons per day, has been brought up to a total of 200,000,000 gallons. The latter figure includes a 72-million gallon high-duty compound engine erected within the last few months, bringing the total capital expenditure upon the city's low-level main drainage system to about \$7,250,000.

The system was designed for an ultimate population, on the fifteen square miles, of 600,000, a mean of sixty-three per acre. The water supply was taken at seventy-five gallons per head per day, with a maximum rate of flow equal to twice that volume, and provision was made for a volume of rainfall, actually reaching the sewers, equal to a depth of one-quarter of an inch falling in twenty-four hours. As these figures were all based upon the sewers running half-full, it is probable that an initial rainfall of an inch or more was really provided for. This is merely an average figure, as the provision for rainfall was not uniformly distributed over the system, four acres, containing deep cellars liable to be flooded during heavy rains at high tide, being favored at the expense of the remainder. This was effected by permitting comparatively free access of storm-water from the former, while the sewers from the latter were, and still are, controlled by automatic regulators, closing when a certain limit of flow is reached. Storm overflows were a fundamental feature of the scheme. The impermeable area has largely increased since the construction of the works, and the consumption of water has risen to 120 gallons per head per day, the former factor, in particular, tending to reduce the "life" of the "combined" system. In this connection, it should be noted that the ultimate efficiency of the undertaking is governed by the capacity of the tunnel under Dorchester Bay, equal, under existing conditions, to 122,000,000 gallons per day. It has been determined, however, that some practicable modifications in the structures and in the method of operating the deposit sewers would bring this up to 154,000,000 gallons. The average daily volume of sewage pumped during the year ending February 1, 1902, was about 86,000,000 gallons.

THE ORIGINAL METROPOLITAN SEWERAGE WORKS

The works already referred to were constructed, and are still owned and operated, by the city of Boston. They provided, beyond a doubt, for the most urgent part of the general sewerage problem of the metropolitan district, but left a large and growing population without any satisfactory means of sewage disposal. One result of this was the gradual extension of the city area made tributary to the pumping system, a process of no avail in relieving those outside areas which had been recognized as forming part of any rational drainage district. The problem, as affecting those portions of the Mystic and Charles river valleys, was complicated by the difficulty, in many cases amounting to impossibility, of dealing with the sewage of any given area within the borders of the municipality affected, and it was finally recognized that no authority, other than that of the State of Massachusetts, was sufficiently comprehensive to embrace the entire district to be served.

Successive commissions, beginning with the Metropolitan

Drainage Commission of 1881, made a study of the situation, but the matter was brought to a head by the State Legislature of 1887 directing the State Board of Health to consider and report on a general system of main drainage for the relief of the two valleys, comprising a metropolitan area of 114 square miles. The report, submitted in 1889, recommended the division of this district into two parts, with an independent harbor outfall for the larger portion (seventy-two square miles) north of the Charles river, containing a population, in fourteen municipalities, estimated at about 280,000 in 1890. The smaller district of forty-two square miles, with a population of about 85,000 in six municipalities, included portions of the city of Boston and other areas which were to have been dealt with, directly or indirectly, by the high-level sewer foreshadowed as part of the city works, together with an area of nineteen square miles, north of the Charles river, which had hitherto not been regarded as forming part of the territory to be drained by the city system. The report of the State Board of Health was adopted, and a first appropriation of \$5,000,000 set apart for the works in 1889. A commission of three members, each receiving \$3,000 per annum for their services, was appointed by the Governor of Massachusetts to control the expenditure, and the execution of the scheme was begun in May, 1890, the Charles river system being completed two years later. The execution of the north metropolitan system, carried on simultaneously, was a much larger and more difficult undertaking, and it was not until the spring of 1896 that the entire system could be said to be in operation.

The Charles river system was designed to meet the prospective conditions in 1930, including an estimated population of 183,000, for which a sewer capacity at the rate of thirty cubic feet per head per twenty-four hours was provided, representing a maximum rate of flow equal to sixty-four cubic feet per second. The system consists of a single line of intercepting sewer, 8 miles in length, with a cross-section of 3 feet 6 inches by 4 feet at its upper end, and 6 feet 6 inches in diameter at its junction with the Boston main drainage system. At this point the invert level is 5½ feet below mean low water. The arrangements between the city authorities and the State commission include an increasing annual payment by the latter to the former, the city undertaking the function of dealing with the sewage in its main sewers, pumping station and outfall works. Including a contribution for sewage discharged through the Neponset valley system, to be referred to later, the payment now amounts to about \$90,000 per annum, but it will shortly cease altogether, on the completion of large works designed to divert the entire flow to an independent harbor outfall.

The north metropolitan system, as originally completed, included a total of forty-one miles of sewers, the largest being nine feet in diameter, together with four pumping stations. The outfall, 6 feet 3 inches in diameter, extends under the harbor bed to a point 1,860 feet beyond the shore line at high water, and discharges into a strong current, which has hitherto obviated the necessity for extension to a more distant point. The basis of the scheme was an estimated population of 571,000 in 1930, a volume of thirty cubic feet per head per day being adopted, except for the cities of Cambridge and Somerville, where the existing

sewerage systems were mainly on the "combined" system, and to a great extent below tide level. A basis of thirty-five cubic feet per head was adopted for these two cities. The result of this modification was to yield a maximum estimated flow of 210 cubic feet per second for the northern system, as against sixty-four cubic feet per second in the smaller southern area.

Many serious difficulties were encountered in the execution of the works, especially in the northern system. These included the laying of an inverted siphon, 6 feet 2 inches in diameter, under a tidal channel (Shirley Gut) between Deer Island and the mainland, and the use of compressed air in quicksands at several places. It is not proposed, however, to enter into any discussion of these interesting features, many of which were dealt with by novel methods, as some details of similar work will be given in connection with a more recent phase of the metropolitan undertaking.

The pumping stations are more numerous than would have been necessary but for a prominent feature of the design. It would have been practicable, by deepening a considerable length of the new sewers, to have dispensed with two or even three of the stations, but the increased volume of excavation would have been only one item of the added expense, as the difficulties of working at the lower level would have been out of all proportion even to those actually overcome. It was decided, therefore, that economy would be attained by adopting a succession of low lifts, with intervening main sewers at comparatively moderate depths, and thus it comes that nearly the entire volume of north metropolitan sewage is lifted twice, and some of it three times, before finally reaching the outlet. Some details of the pumping plant will be given further on. It should be stated here, however, that the total cost of the original works of both systems amounted to about \$6,000,000.

ADDITIONS TO THE ORIGINAL METROPOLITAN WORKS

From what has already been stated, it will be seen that the two metropolitan sewerage districts created by the Act of 1889 included portions of the area of forty-three square miles, in Boston and other municipalities, not provided for by the city's low-level system. A further encroachment, to the extent of seventeen square miles, was made upon this area by an Act passed in 1895, authorizing the construction of what is known as the Neponset valley system, providing for a total area of 39½ square miles* in four municipalities. This system connects, by gravity, with the Boston main drainage system, but not at the same point as the Charles river system, and the annual payment to the city of Boston for sewage disposal includes a contribution in respect of the Neponset system. This was designed on a basis of thirty cubic feet per head for a prospective population, in 1930, of 213,000, involving a maximum sewer capacity equal to seventy-four cubic feet per second. The system originally included 11½ miles of sewer, the largest being 4 feet 6 inches in diameter, and was substantially completed in 1897 at a total cost of about \$850,000.

Minor additions to the contributory area had meanwhile been made in other directions, so that at the end of 1898 the

north metropolitan district covered 84½ square miles, provided with fifty-one miles of metropolitan sewers, while the combined Charles and Neponset valley systems embraced an area of seventy-nine square miles, with 19½ miles of sewer. But the process of absorption and extension was still not at an end. Acting upon the recommendations of a special report, for which \$30,000 had been voted in 1898, the Legislature of 1899 passed an Act authorizing the Metropolitan Sewerage Commission to construct a high-level gravity sewer on the general lines laid down by the Boston Commission of 1875, but discharging into the outer harbor by an independent outlet off Nut Island, instead of being connected with the city outfall sewer at Squantum. Under this Act, an addition of twenty-one square miles was made to the district already partly drained by the Charles and Neponset systems, this being made up of (a) the Boston area not hitherto dealt with, (b) two square miles of the original low-level district of that city, and (c) the entire city of Quincy. A first appropriation of \$4,600,000 was made for the necessary works, which were begun in the autumn of 1899, and are now practically completed. They are intended not merely for the purpose of providing an outlet for the sewers of the added twenty-one square miles, but also to intercept the sewage of the Charles and Neponset valley systems, now flowing into and dealt with by the city works. In the case of the Charles river system, the sewage will be diverted to a pumping station and there lifted forty feet into the head of the high-level sewer. On the other hand, the Neponset valley and Boston areas, with the exception of about two square miles (for which a small pumping station will ultimately be required), will drain by gravity into the high-level sewer. The sewage of Quincy, which has been pumped into the Boston outfall at Squantum since 1899, will also be tributary to the high-level sewer, partly by pumping, partly by gravity. The sewer capacities for the high-level system are based upon the anticipated conditions in 1940, which include a population of 986,000, and a volume equal to a flow of forty cubic feet per head per day has been adopted. Applied to the estimated population, this represents a maximum flow of 458 cubic feet per second.

In connection with the adoption of the high-level project, the districts served by the Charles and Neponset river systems were grouped with the added high-level area into a new south district, 102½ square miles in extent, the whole of which will be tributary to the new sewer. The north metropolitan district of 90½ square miles, including six square miles, added in 1903, retains its original title. There is, therefore, a total metropolitan area under State jurisdiction of 193 square miles, seventy-six square miles larger than the administrative county of London. This is exclusive, of course, of the thirteen square miles controlled by the city of Boston, the remaining city area of 24½ square miles forming part of the metropolitan sewerage district.

THE HIGH-LEVEL WORKS

The high-level gravity sewer is seventeen miles in length, measured from the point at which it intercepts the sewage of the Charles river system to a point one mile beyond low water at Nut Island. The masonry sewer structures, aggregating 15.3 miles in length, vary in cross-section from 6

* Originally 44.27 square miles, but 4.70 square miles, forming the town of Westwood, were excluded in 1900.

feet 6 inches by 7 feet to 11 feet 3 inches by 12 feet 6 inches, the latter equivalent to a circular sewer 12 feet 2 inches in diameter. They are generally of the "horse-shoe" type, with slightly pointed arch and dished invert; the horizontal diameter is about nine-tenths of the vertical. Concrete was largely used for the backing of side walls and invert, with either one or two rings of brick lining, the latter being adopted where any considerable head of ground-water existed. In some cases concrete was also used for the arch, but as a general rule this is of 12-inch brickwork, i.e., three rings, laid in cement mortar.

The 60-inch cast-iron pipe outfalls have a mean length of just over a mile each, connections being left in the sand-catcher for an ultimate provision of five, of which only two are yet laid. There are rather more than four miles of 11 feet 3 inches by 12 feet 6 inches sewer, laid at a gradient of 1 in 3,500; this inclination prevails throughout, except for a length of 5,000 feet at the upper end, in which the gradient is 1 in 2,500. Of the total length, 4.1 miles are in tunnel, of which 2.5 miles are in rock. The 5,000-feet length of 6 feet 6 inches by 7 feet sewer just referred to, though constructed as part of the main line, is in reality merely a branch of it, as provision is made at their junction for an extension of the latter to Newton and other areas. The branch will convey the Charles river valley sewage lifted into its upper end by the new pumping plant, while the main line extension will not be carried out until it becomes necessary to relieve the low-level Charles river system by diverting high-level sewage into this proposed gravity interceptor.

The work was divided into thirty-six sections, involving forty-six constructional contracts. Among these special interest attaches to the two 60-inch harbor outfalls from Nut Island. The 11 feet 3 inches by 12 feet 6 inches outfall sewer is carried from the mainland to the island in an embankment, about 1,000 feet in length, forming a 25-foot roadway with pitched slopes. The elevation of the sewer invert on the island coincides with mean high water. Sand-catchers, in duplicate, of enlarged cross section to favor the deposit of heavy substances, intervene between the outfall sewer and the pipe lines, and screens are provided to intercept floating matter. Spigot and socket pipes, 1½ inches thick, with sockets 5½ inches deep, and weighing 12,000 pounds per 12-foot length, are used for the work in the harbor. One-fourth of the total number have the exterior surface of the spigots turned to a 1/16-inch taper in a length of 5½ inches for use in joining separate sections of four pipes each.

The problem consisted of laying these pipes in a trench averaging 9 feet deep, at a maximum depth, to bottom of trench, of more than fifty feet below mean high water, with outlets about twenty-five feet deep, the harbor bed consisting mainly of stiff clay. Strong tidal currents, due to a mean tidal range of ten feet, prevent continuous diving work. A trench, ten feet deep at bottom and with a mean top width of thirty feet, was dredged to a depth of two feet below the intended level of the pipes. Piles were then driven in pairs, and capped, so as to form two points of support for each pipe at the proper elevation. The pipes were lowered on to the caps in 48-feet sections, with three leaded and caulked joints, the rear end of each having a turned spigot which had

previously been fitted, on shore, into its corresponding socket and withdrawn after the lead had been run. The sections were fastened upon a floating cradle, six feet square and fifty-two feet long, which could be weighted by the admission of water through valves. They were lowered from lighters, and the cradles were left attached to the pipes until divers had drawn the latter home, by ratchet braces, into the open socket of the last preceding section. The cradle was then released and hauled to the surface, where the water was forced out of its nine compartments by an air-pump. The connecting joints were then caulked by the divers, who also secured the pipes in position by wedges spiked to the pile caps. The dredged material was then returned to the trench. The data for line were given from two transit stations, and the elevations were determined by the height of tide signalled from a tide-gauge on Nut Island.

The outlets are formed of special quadrant bends, weighing nearly ten tons each, surrounded by piling and crib-work.

The tunnel work on the high-level sewer was of a very varied character. In one section of 9 feet 3 inches by 10 feet 2 inches sewer, 5,300 feet long, the length of open cut was only 283 feet, the remainder being in rock tunnel, mainly through a very hard and flinty variety of felsite. The maximum depth of the tunnel was 145 feet. Compressed air at eighty pounds per square inch was used for the drills, steam being furnished by two 100-horse-power horizontal tubular boilers. The usual type of construction was departed from in the adoption of a solid concrete arch instead of three rings of brickwork. The concrete footings, sidewall backing and arch were first put in place, the timber lagging for the side walls being sufficiently thick to leave a space for the subsequent insertion of a 4-inch lining of Portland brick-work. The concrete, mixed by a gravity-mixer near the bottom of the shaft, was taken through the completed headings in cars drawn by a small locomotive. Three-inch I-beam frames, curved to the contour of the side walls and arch and stepped into 4-inch grooves left in the concrete footings, were used as ribs for the side-wall lagging and as a support for the arch centers. The latter consisted of ½-inch steel plates, 5½ feet long and 14 inches wide, stiffened on one side by a 3-inch I-beam, curved transversely to the inner contour of the sewer and weighing eighty pounds each. These were built up behind the frames as the concreting progressed. Their working faces, besides being smoothly finished, were coated with oil before use; this resulted in a smooth finished surface throughout the interior of the arch. The completion of the concrete invert was left over until after the removal of the locomotive rails. The final process was the building of the 4-inch brick invert and sidewalls, the latter occupying the recesses left by the over-hanging concrete arch. The volume of concrete for the entire structure, thus built, averaged about 2½ cubic yards per linear foot.

Considerable trouble was experienced in building another tunnel section, consisting of 4,775 feet of 9-foot circular sewer, the circular cross-section having been adopted in place of the normal "horse-shoe" type in anticipation of the use of a shield. Of the total length, 3,500 feet were in very fine sand, with the ground water standing at an elevation of thirty feet above the sewer invert. After the work had been

taken out of the contractors' hands the Board decided to construct the sand tunnel by direct labor, and a new shaft was sunk, from which headings were driven at an aggregate rate of fifty feet per week. The shaft was formed of segmental steel cylinders, a boiler-plate air-lock on the surface being used to sink the lower part under air pressure. The same system was used for driving the headings, the locks at the foot of the shaft being twelve feet long, five feet wide, and six feet high. The working air pressure of seventeen pounds per square inch was maintained by three compressors, supplied with steam by three 100-horse-power boilers.

The headings were driven in 12-foot sections, the upper part only being excavated at first. Under the pressure named, the influx of water ceased, and the fine sand could be readily shaped to the desired circular contour. As fast as this was done, plates of $\frac{1}{8}$ -inch sheet steel, three feet long by one foot wide, curved longitudinally to a radius of six feet, and weighing forty pounds each, were laid against the face of the roof and temporarily supported by screw-extension struts, reacting against planks on the floor of the drift. These plates were bolted together through interior flanges, formed of 2-inch by 2-inch by $\frac{1}{4}$ -inch angles, half plates being used at the ends to break joint. Generally, the plates were carried round the upper two-thirds of the circular perimeter of the headings, but in more favorable ground a less extent was found practicable.

As soon as the roof was sufficiently protected, the lower portion of the heading was taken out, and a 12-inch by 12-inch horizontal central needle-beam introduced. This served as a footing for further extension struts, extending radially round the heading, enabling the temporary struts to be removed and leaving a comparatively clear field for the building of the sewer. This was of 12-inch Portland cement brickwork throughout, laid directly against the plates, which were of course left in the work.

For a length of nearly two miles the outfall sewer is constructed in an embankment carried up to a height of nineteen feet above the level of the marshes and three feet above the sewer structure. With a top width of twenty-eight feet, and slopes of two to one, the embankment is 100 feet wide at the base. An area of fourteen acres of upland was purchased in order to supply the material required. The site of the embankment is underlaid by strata of mud and peat to a maximum depth of twenty-eight feet, and the settlement was carefully observed before the work of sewer construction was begun. Piling, cut off at an elevation of three feet below mean low water, was used to some extent in this and other portions of the work.

Water was found in large volumes on most of the contract sections; on one of these the contractor had to raise about 1,000,000 gallons per day, with a maximum of 1,500,000 gallons, over a prolonged period. Sub-drains were almost invariably used; they consisted of open-jointed pipes, six inches to fifteen inches in diameter, laid in a trench below the sewer, and surrounded by screened gravel.

The pumping station at which the sewage of the Charles river system is to be lifted forty feet into the head of the high-level gravity sewer includes a boiler house, fifty-seven feet by thirty-five feet, an engine house, 118 feet by 56 feet,

and an underground coal-pocket, fifty feet by thirty-five feet, together with dynamo room, machine shop, etc. The engine-house dimensions admit of an additional engine when required, making three in all. The contract for the engines and boilers included two vertical, inverted, triple-expansion, three-crank fly-wheel pumping engines, with three single-acting plungers under the cranks; four boilers of the vertical, water-leg, internally fired, fire-tube type; a Green fuel economizer; feed-water heaters; a traveling crane in the engine-room, and the necessary piping and fittings. The contract stipulates for a maximum of twenty-five revolutions per minute, and a capacity in each engine of 50 million gallons in twenty-four hours, at a plunger speed not exceeding 250 feet per minute. It is further stipulated that each engine must be capable of being easily, safely, and economically operated at all rates between 20 million gallons and 50 million gallons per twenty-four hours. Each engine must perform a duty of not less than 150 million foot-pounds for each one thousand pounds of commercially dry steam used by the engine and any auxiliary pumps supplied by the contractor and operated during the 10-hours' duty trial. During the trial the engine was to be operated continuously at its rated capacity against a total head of forty feet, and supplied with steam of not more than 150 pounds pressure per square inch. The engines, as erected, have steam cylinders respectively 21, 38 and 58 inches diameter, with 60-inch stroke. The pumps, placed beneath and directly in line with the steam cylinders, are of the single-acting inside packed type, with plungers 48-inches in diameter.

The sewage is to be delivered into the high-level sewer through two lines of 48-inch force main, following different routes and aggregating 3,300 feet in length. Venturi meters and recording apparatus, at the outlets from the station, are notable features of the design.

THE METROPOLITAN SYSTEM IN 1904

The completion of the works now nearing their consummation will leave only the contemplated extension of the high-level sewer to be undertaken, and this, as already stated, will not be done until relief for the lower levels of the Charles river system is required. In summarizing what has thus been accomplished for the area of 193 square miles not provided for by the Boston low-level system, some more detailed reference should be made to the three principal pumping stations of the north metropolitan system. The same type of specially designed plant was adopted for each, both in the original installation and in the additions made in 1899. The pumps are of the centrifugal type, with vertical shafts, the submerged pump-wheels being 8 feet 3 inches in diameter in two of the stations, and 7 feet 6 inches in the third. These run at speeds varying from sixty to 100 revolutions per minute. Each pump-wheel is driven by a triple-expansion condensing engine of the Reynolds-Corliss type, the three cylinders being set at angles of 60° . At the two main line stations there are three such engines and pumps, each capable of raising 45 million gallons per day, with a 19-foot lift. The third station is provided with two plants each equal to 22 million gallons per day, with an 11-foot lift, and one plant of 60 million gallons per day, with an 18-foot lift. The

average daily pumpage at these three stations, in 1903, amounted to about 54, 52 and 30 millions of gallons respectively. The fourth pumping station is much smaller, and on different lines. It has a total capacity of 22 million gallons per day, with a 13-foot lift.

On January 1st, 1904, there was a total of ninety-four miles of metropolitan sewer, contributed to by 934 miles of sewer owned and controlled by twenty-five separate municipalities, whose aggregate population was estimated at about 786,000. Of this total, about 510,000 persons were connected with the metropolitan system, and works for effecting the connection of the remainder are either under construction or arranged for. Among these the most important are the 12½ miles of branch intercepting sewers, with a maximum diameter of 4 feet 9 inches, required to secure for the Boston city areas the benefit they are to derive from their inclusion in the metropolitan undertaking. These alone are estimated to cost the city \$1,500,000; but even this does not represent the total outlay which must be incurred. Not only is the high-level gravity sewer designed to take sewage only, to the exclusion of rainfall, but the Act under which it was constructed contains a binding stipulation to that effect, so that many existing "combined" sewers will have to be replaced by new sewers, on the "separate" system, in order to bring about the ultimate condition kept in view. The question was ably discussed in a report by Mr. E. S. Dorr, Chief Engineer of the Boston Sewer Department, published last year. In it he refers to the necessity of similar measures in parts of the low-level area of thirteen square miles, and states that there are sanitary reasons which will justify them in those portions of the system in which overflows take place into two partially land-locked bodies of salt water. To apply the dual system to the entire low-level area would, he states, cost \$6,000,000. In this connection, a quotation from Mr. Dorr's report will serve to show the extent to which "separation," as understood in America, differs from what frequently goes by the same name on this side: "A system which removed only surface water from the streets and such roof water as came down the leaders of the buildings (in front) would take less than half the surface water of a district, for the area of roofs and yards is about 70 per cent. of the total. Such a system would not be a separate system at all, but would consist of a combined system from which a portion of the surface water had been removed, namely, 30 per cent., and a surface drainage system carrying that 30 per cent."

The north metropolitan and Charles river systems, though designed with an eye to the separation of rainfall from sewage, cannot be operated upon a rigid interpretation of that term so long as combined sewers, in Cambridge, Somerville and Boston are connected therewith. Special attention has been directed to the effect of the necessary discharge of storm overflows into the Charles river in connection with proposals, finally sanctioned during the present year, to construct a dam across it. This will have the effect of forming an elongated basin, with a water-level eight feet above mean low water, into which these overflows could not continue to discharge without creating a nuisance. The project, therefore, includes large marginal conduits to intercept the flow and convey it to points below the dam.

Apart from this measure, however, much has already been done, especially in Cambridge and Somerville, towards the introduction of the separate system, and the tendency is to work along that line. Under the provisions of an Act passed in 1903 owners of property must, at their expense, convert the drainage and plumbing work of their houses to that system whenever separate conduits have been provided by the local authority. The same Act authorizes cities and towns using the metropolitan sewers to defray, from funds borrowed outside of the statutory debt limit, expenditure within certain limits upon the duplication of sewers for separation purposes. It provides, further, that the Board controlling the metropolitan sewerage system may, within the same limits, call upon the local authorities to incur such expenditures.

FINANCIAL AND GENERAL

The expenditure on metropolitan systems is met by contributions from the various municipalities, devised to cover the repayment of principal and interest in forty years, and the annual cost of maintenance and operation is likewise borne by the respective areas. In order to bring the payments under the first head more nearly into proportion to the increased use of the system by a growing population, it is provided by the Act that, instead of refunding one-fortieth of the entire sum in each year, the repayment shall be apportioned as follows: 5 fortieths in the first ten years, 6 2-3 fortieths in the second ten years, 13 1-3 fortieths in the third ten years, and 15 fortieths in the fourth ten years. The bonds bear interest at the rate of 3 per cent. per annum.

The several Acts further provide for the appointment, by the Supreme Judicial Court of Massachusetts, of three Commissioners, not residents of the sewerage districts, to determine the proportions in which the several contributory areas shall annually, for the term of five years next ensuing, pay the amounts required. Separate commissions are appointed for the north and south metropolitan districts respectively. Hitherto, they have in each case apportioned the repayment of the loans, with interest charges, upon the basis of valuation and the maintenance and operation charges upon population. Efforts have been made, by some of the contributory municipalities, to bring about some modifications in this method of apportionment; in particular, it has been urged that areas distant from the outfall works should be assessed upon a higher scale than those whose natural facilities for sewage disposal are greater, but the "unit" idea has always prevailed, and the district has been treated as a whole accordingly.

The original Metropolitan Sewerage Commissioners appointed as their Chief Engineer, Mr. Howard A. Carson, who had been prominently identified with the preliminary investigation by the State Board of Health. He was succeeded, on his retirement in 1895, by Mr. William M. Brown, who was retained at the head of the sewerage undertaking when, in 1901, a consolidation was effected between the Metropolitan Water Board and the Board of Metropolitan Sewerage Commissioners as the Metropolitan Water and Sewerage Board. During the period of greatest activity in construction, over one hundred assistants were employed in the engineering department alone.

THE AMERICAN SEWERAGE PROBLEM

The Author has discussed the Boston City and Metropolitan Works at greater length than would have been desirable were it not for the fact that their development is typical of changes operating generally in America. While he has thus been enabled to place a concrete example before this representative body of English municipal engineers, there are some leading features, affecting American sewerage works generally, to which it may be well to refer. Among these, the most prominent and important is the tendency towards that separation of rainfall from sewage which the late Sir Edwin Chadwick labored to promote in Great Britain. It has been shown incidentally that American ideas on this subject are of a very advanced type, inasmuch as they do not tolerate the exclusion of roof and yard water from the rainfall conduits. It must be said of Americans, in this as in other respects, that they have the courage of their convictions, and that when the advantages of a certain line of action have been duly grasped, the logical course in regard to it is unswervingly pursued. As exemplifying this characteristic, the Author may say that while he has never known, in America, of a case in which ventilating manhole grids were closed on account of alleged nuisance, this step is becoming increasingly common as a means of preventing the ingress of rainwater to "sanitary" sewers. This procedure is greatly facilitated by the growing practice of dispensing with disconnecting traps between houses and the street sewer, but it should be borne in mind that this has not been brought about by any objection to open grid sewer ventilation. The absence of complaints in this respect has, in fact, always impressed the Author as being one of the most remarkable facts connected with American sewerage works, and he is constrained to attribute this immunity, at least in part, to the more generous use of water demanded by American ideals.

The extent to which separation is insisted upon in American sewerage design must be credited with a share in the attention devoted to hydraulic formulæ and their application. The Eyelwein formula for sewer discharges has everywhere given place to the development of the Chezy equation elaborated by Messrs. Kutter and Ganguillet. The chief merit of the latter lies in the fact that it includes a coefficient (*c*) varying with the mean velocity and depending also upon a natural coefficient (*n*) corresponding to the surface friction (roughness) of the different materials of which the sewers or other channels are constructed.

In like manner, American engineers have devoted much study to the complex problems involved in determining the capacity of rainfall conduits, due regard being paid, in particular, to the maximum intensity of the actual rainfall to be taken into account in a given locality, the inclination of the area, and the proportion of rainfall which may be expected to reach the channel. It is becoming more generally recognized that, while the relative degree of permeability of surface plays a leading part in this connection, the shape of the area must also be taken into consideration, and that other local conditions may seriously affect the results derivable from earlier rainfall and retardation formulæ. Among those who have made a special study of this problem must be

mentioned Mr. Emil Kuichling,* of Rochester, N. Y., and Mr. R. E. McMath, of St. Louis, to both of whom civil engineers generally are under obligations for patient investigation and published results.

The study of rainfall records, and the application to them of available formulæ, have resulted, in America, in a noteworthy expansion of ideas in regard to the dimensions of rainfall conduits. On the other hand, the rigidity with which it is regarded as possible to adhere to the exclusion of rainfall from "sanitary" sewers has had its effect in reducing the size of the latter to an extent otherwise impossible. In this way, 8-inch pipes may be said to be the standard for ordinary street sewers, a fact exemplified in the system designed by American engineers for the city of Havana, in 1900, in which 89 miles, out of a total of 124 miles, were of that dimension.

The use of small pipe sewers carries with it the obligation of limiting the ingress of subsoil water, as conforming to that general restriction of volume which is aimed at in "sanitary" sewers. Contrary, however, to English practice, what are known as patent pipe-joints are not used, reliance being placed upon the filling of the annular spaces with Portland cement, generally mixed with a small proportion of sand to prevent cracking. The Author, whose experience includes work on local systems contributory to the metropolitan sewers, found that the best results could be obtained from the use of very dry mortar, forced home into wide sockets with wooden tampers. Wherever water is found in the trench a sub-drain is essential to success. Some attention is being paid to the use of asphalt joints, which possess a considerable advantage in greater elasticity and in the speed with which the line can be covered up after jointing. It should be stated, as bearing upon the use of small pipes, that while it is possible to obtain a very high standard of water tightness provision for infiltration is made in the design of works.

As regards sewage disposal in America, the Author feels that a discussion of this branch of the sanitary problem would extend, to an inordinate degree, a paper which has already exceeded the length he had assigned to it. There is the more reason for abstention in this respect in the fact that the ultimate disposition of sewage in America has not yet entered upon the stage it reached many years ago in Great Britain. Coast towns largely prefer the sweet simplicity of harbor outfalls to entering upon the respective domains of irrigation, precipitation, or filtration, and there is a disposition to watch the results of bacteriological research elsewhere before adopting any of the methods which have been more freely tried in this country. That this has not been allowed to stand in the way of independent study is best shown by a reference, scarcely needed in an assembly of this character, to the Lawrence experiments of the Massachusetts State Board of Health, and to investigations, in other directions, conducted by Mr. X. H. Goodnough, the present Chief Engineer to that Board. But the tendency already noted prevails also in inland towns, where reliance is placed upon the fact that the sewage of a thousand persons, discharged into a volume of running water equivalent to a flow of seven cubic feet per second, has never been known to cause a nuisance.

THE ENGINEER'S STATUS AND RESPONSIBILITY

Some Considerations Suggested by Recent Water Works History in Philadelphia

By Alexander Potter.*

ABOUT three months ago, the Mayor of Philadelphia appointed an expert commission of engineers to investigate the alleged frauds in connection with contracts for public works in that city, with special relation to the contracts for the water filtration plant which should have been completed over a year ago. This commission has recently handed down its report, condemning in no uncertain tone the engineer who wrote the specifications and supervised the construction of the work. The facts presented are impressive, and it is unfortunate that the engineer's side of the story is not attached to the report, so that the unbiased reader might have an opportunity of forming his own opinion as to the guilt or innocence of the accused official. The engineer has been indicted and his trial set down for an early date, and on this account his lawyers have imposed silence upon him. He is charged, in short, with fixing the specifications and contracts for favorite contractors, and of ruining foolhardy and unwelcome bidders who were presumptuous enough to force themselves in for a share of the work. Final judgment should be suspended, however, until the accused engineer has been given a fair opportunity to be heard in his own behalf. It is unfortunate that the time selected for the presentation of the report should have been but a few days before an election, for, with or without reason, the friends of the engineer can claim that it was presented purely for political purposes, and so spoil much of the moral effect of the report.

If the charges are true it is to be regretted that an engineer should have lent himself to such practices, not only on account of his personal injury, but because such things cannot but have their influence on the minds of citizens and public officials and carry with them most serious consequences. But even if this instance of misfeasance be true and indefensible, it is not right, without due and careful consideration, to draw too general and wide conclusions in regard to restricting the powers and responsibilities of engineers on public work in general, or refusing to allow the proper and full exercise of the functions appertaining to that office, for in that case we are going to an opposite extreme and inviting, perhaps, a more serious and more general evil. The engineer is, without question, not only the repository of scientific knowledge regarding the construction of public improvements, but a safe-guard and check upon the reckless or ignorant expenditure of public moneys, such as cannot be secured in any other manner. In the engineer, therefore, must repose the largest amount of trust and responsibility upon all public work, and he must be made professionally responsible for the honest and righteous perform-

ance of his duty in this respect. It is axiomatic that a contract for public work cannot be completed without opportunities offering themselves to the engineer to make allowances to the contractor on account of conditions which cannot be foreseen and of which the value cannot be determined when the contract is drawn. Even the establishment of unit prices does not obviate this difficulty, for it is unjust and unfair to the city to pay to the contractor large sums of money where the quantity greatly overruns and the unit price is excessive. It is equally unjust to the contractor to require him to execute indeterminate quantities of work when his unit price, given generally on a limited quantity, proves to be below what the work is actually worth. To the engineer, therefore, must of necessity be entrusted the fair estimate and adjustment of many details. The knowledge, on the other hand, that the engineer will fairly and honestly exercise the power of establishing a just value for such work unquestionably tends to lower the unit prices bid by responsible contractors, so that the elimination of that power on the part of the engineer would not be for the best interests of public work even if such an end could be attained. Because one man is alleged to have betrayed his trust and high responsibility is no proof that engineers in general are guilty of the same dereliction of duty, or that they should be deprived of, or acquiesce in being deprived of, their proper professional responsibilities and functions. These, when properly exercised, as I think this exception proves to be the rule, saves the city or company for whom it is exercised large amounts of money, gives weight and character to the position of the engineer and his profession, and distinguishes him and it from that of a mere accountant or surveyor.

The conditions said to exist in Philadelphia do not, in the opinion of the writer, prevail the country over. There is more talk of graft than actually exists, bad as are the revelations in instances now coming to light. It is the truth, moreover, that honesty cannot be legislated into men, nor can a dishonest engineer be made honest by robbing him of powers justly belonging to a man in his position, as he may still find a way or other evils be invited more than counter-balancing the good believed to be thus secured. The solution lies in a more careful selection of men of known fitness and experience for the special work to be entrusted to them and a greater freedom of action given to the engineer when once selected. A trust is then reposed in him too great to be denied or shifted at the demand either of unscrupulous politicians who would "use" the engineer or of his own personal greed, and if this is done public work will be both better and more honestly performed.

* Consulting Engineer, New York City.

CONTINUOUS LINES OF IMPROVED ROADS

A Review of Present Conditions and a Demonstration of the Necessity for Improvement

By Col. W. L. Dickinson*

THE movement for better roads is gradually spreading over the entire country. Their value is so universally understood that undoubtedly, within a few years, nearly every State in the Union will have taken some action towards improving its highways. The good example set by those Eastern States which have given State aid has been followed until seventeen States of the Union have taken steps in imitation of these pioneers. I do not mean to say that all of the seventeen have made large appropriations of money, but they have all provided some State authority to have jurisdiction in the matter of road improvement.

During the past few years we have been building short stretches of good roads to demonstrate the value of such roads. Their value has been fully established, and their cost cannot be compared with the great benefits derived. The time has now arrived when we should connect these short stretches of roads to make continuous good roads or trunk lines leading across the country in various directions, giving first-class roads to the various centers of trade, which will particularly benefit the rural districts.

Hon. James H. MacDonald, of Connecticut, is the first State Highway Commissioner to recommend a State appropriation for connecting these links to make continuous good roads. An appropriation for this purpose was made this year by the Connecticut Legislature.

With a continuous good road, farmers can haul their products to market with a great saving of horses, vehicles and time as compared with a poor road or one which has short sections in good repair with most of it in poor condition. A perfectly good road enables him to deliver his products at any time and take advantage of a favorable market.

The benefits derived from continuous good roads are of great commercial value to the country, affecting all branches of trade. Reducing the cost of transportation of our products to market results in a reduction of the cost of these products to the consumer. A large percentage of the freight carried by the railroads and on our waterways is first hauled over our common roads. All transportation companies should be greatly interested in the construction of well-built roads, capable of being used at all seasons and

in all weathers, as such roads would assist in preventing congestion and in equalizing their freight traffic.

In large cities where roads are good, the motor truck is rapidly superseding the dray horse. It is cheaper, more convenient, more efficient, more humane and more cleanly. Large motor trucks are used for freighting purposes and the delivery automobile is used by merchants to deliver their goods. Express companies use them to collect and deliver express matter. Under fair conditions, they everywhere seem to perform their work with convenience and efficiency. In the West, the farmer uses the traction engine to plow, harrow and seed his land and cut his grain. With the great improvements that are constantly being made in the manufacture of motor vehicles, it is fair to assume that the day is not far distant when they will be used by the farmer to carry his products to market. The motor vehicle is certainly already a success, and how long a list of other important uses the future will show no one can predict. The automobilist and the farmer should get together and work for good roads.

There is a growing sentiment throughout the country that the Federal Government should appropriate money to assist in building trunk lines of roads. Large sums of money have been expended by the National Government to improve our waterways, to encourage the building of trunk lines of railroads, and to build roads in the Philippines. It would seem as if public convenience and necessity demanded that the same Government should equally assist in the internal development of our country by improving the highways. It seems strange that a country which leads the world in progressiveness should allow its roads to get into such a deplorable condition, ours being the only civilized country that has neglected its highways. European countries have national systems of roads, the best features of which could well be copied by this country to its great advantage.

The different elements favorable to improving our highways should unite and urge favorable action by Congress. The people of this country are awakening to the economic importance of this great reform, which in the near future will become our next national work for internal development. It calls for concentrated action, and all those interested in this great problem should do everything in their power to aid the movement for better roads, and to insure the construction of a system of highways which will meet the real needs of the country.

* From an address delivered at the annual meeting of the Springfield, Mass., Automobile Club, November 10, 1905, by the Author, Chairman of the Executive Committee of the New York and Chicago Road Association.

BRICK PAVING

Present Day Methods—The Result of Experience in Faulty Construction— Largely Based on Increased Attention to Details

AMERICANS of the present generation are being slowly weaned from the tradition, for which there was only too substantial a foundation, that their country is, and must remain, hopelessly behind the rest of the world in the matter of common roads. Even though it be possible to apply the past tense to the consideration of this condition to-day, it is still true that returning tourists include the splendid highways of European countries among the most striking features seen in their travels, noting, if philosophically inclined, that while the bicycle craze has been an important factor in the improvement of American roads, the case in England was reversed, the excellence of these arteries being there the principal encouragement to the investment of large sums in "wheels." In one respect, it is easy to understand the prolonged existence, in America, of conditions which will require, at best, many years of persistent and well directed effort to remove, the "magnificent distances" of the country and the relative sparseness of the population being ample deterrents from action upon a commensurate scale. But these things do not account for the defective methods employed in the construction of such roads as were actually laid out, it being only within recent years that this matter has been given the attention it deserves.

This fact has been effectively recognized by some State Legislatures, notably that of Massachusetts, whose Highway Commission gives equal attention to the provision of good roads and to the inculcation of scientific knowledge in a subject where, formerly, not even rule-of-thumb could be said to prevail. The present issue of this journal contains evidence, in an address by Col. W. L. Dickinson, of the growing interest in a long neglected problem, that gentleman being prominently identified with a movement for building a new road, on modern principles, between New York and Chicago. The promoters aim to make this road "of such a character that it will be a benefit to every municipality through which it passes, and to every individual along its route. It is to be primarily a useful highway, not designed for the special benefit of pleasure seekers, nor for the exclusive use of those intent on business, but one which all classes of citizens will find a convenience, a benefit and a paying investment." And no reference to the good roads movement, at this time, would be complete without recording the passage, at last month's election, of an amendment authorizing the expenditure of \$50,000,000 in road construction in New York State, where attention has been largely confined, in the past, to the development of the Erie Canal. This, too, although in the last ten years the annual tonnage transported by the canal was less than four million tons, while the weight of crops going from the farms on roads hardly deserving that name has been nearly four times as great.

Earlier efforts in the direction of improved roads naturally drifted toward the substitution of a hard filling for a soft one, and thus led, insensibly perhaps, to a more or less macadamized type of surface, but it was soon found that something was lacking in this form of construction, the question of cleaning and maintenance looming large in any thoroughgoing study. This has reference not merely, or even mainly, to the pavements within cities, but in an important degree to those extramural roads the necessity for which is forcing itself upon the attention of county authorities with ever increasing strength. One of the most significant signs of the times, in this respect, is to be found in the construction of highly improved roads, with practically permanent surfaces, through long stretches of rural territory which, not so many years ago, would have been left to their own devices in the matter of scientific traction. What it may be hoped is a representative example of this class was recently seen under construction by the writer, nearly four miles of fourteen-foot road being intended to facilitate the transport of country produce to the city of Cleveland, Ohio. This work is only a small part of what is being done, along similar lines, under the direction of Mr. W. H. Evers, County Surveyor, but it is remarkable for the use of brick paving blocks over its entire length. The restriction of the paved surface to a fourteen-foot strip, with deep sunk curbs, in the center of the old road location, while leaving ample room for the traffic to be accommodated in these districts, facilitates the laying, within that width, of an originally expensive, but, in the end, a really economical class of pavement.

While paving materials generally seem to be endowed with all the elements productive of controversial warfare, it would be difficult to find any single one over which so many differences of opinion, not to say prejudices, have been stirred up as that generally known as brick. It is important thus to qualify the reference, inasmuch as there are wide differences, both in type and quality, in the material so classified, and it is probable that much of the existing misconception as to its value as a paving material could be traced back to a too facile belief in a brick being a brick. It may be said, however, that the question of quality, as material, is no longer a matter for discussion on once familiar lines, the determinations of "rattler" and other tests having removed that factor to the higher plane of scientific knowledge and investigation. Not until it becomes necessary to put the brick in place is it possible to realize the number of small and, to the neophyte, apparently unimportant details the observance or neglect of which may, and frequently does, mean the difference between a satisfactory brick pavement and one deserving all the condemnation which has frequently been bestowed upon examples of this kind.

To begin with the foundation, this may, under favorable conditions, be a filling of suitable material on the natural bed, the depth depending on the character of the latter. Rolling or other method of consolidating the bed is essential, but danger lurks even in this elementary phase of the work, for it is quite possible to overdo the weight of the roller and thus transmit a part of its otherwise useful effect in the form of waves, undulating in advance of the roller's progress, instead of exerting the desired downward thrust. A weight of eight tons is sufficient in all ordinary cases and it is advisable, even then, to use a water-roller, capable of being reduced to five tons—the maximum not being applied until the work has been prepared for it by a lighter rolling. Where the natural bed is not sufficiently stable to justify this reliance upon it, or where the contemplated traffic calls for the taking of every available precaution, a layer of cement concrete must be interposed between the base and the sand cushion which all authorities are agreed in regarding as essential to the success of any brick pavement. This should not be less than two inches thick, in saying which it must be understood that the thickness should also be uniform, a condition obviously incompatible with the ragged and uneven surface only too frequently considered "good enough" for the concrete face. No projecting pebble should raise its head above the general level, and the surface should be neatly flattened as the final stage of the concrete work. At least thirty-six hours should elapse between the laying of the cement and the spreading of the cushion.

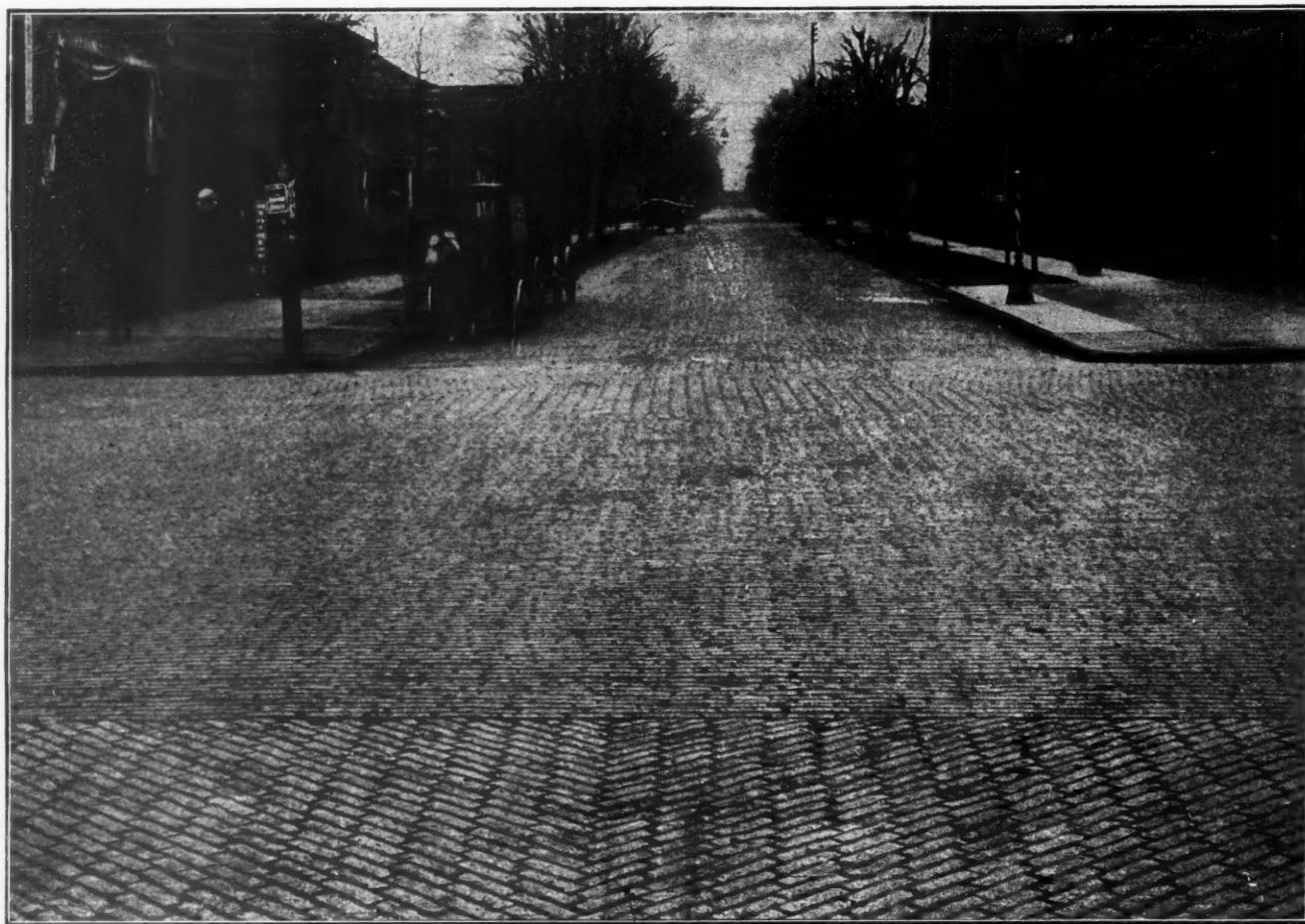
The actual paving material comes in two standard sizes—three, if account be taken of the five-inch depth sometimes substituted, in the larger, for the ordinary four inches. The so-called paving brick measures $8\frac{1}{2}$ inches by $2\frac{1}{2}$ inches on face, while what are known as paving blocks are $\frac{3}{4}$ -inch wider—the number required to cover a square yard being fifty-eight and forty-five respectively. They should be laid at right-angles to the length of the street and settled into the sand cushion by the passage of a five-ton roller over them. As ordinarily made, both bricks and blocks provide for a sufficient joint space to admit of the flow of the "filler," in mentioning which one of the most debated points of brick paving construction presents itself, the end of the battle between sand, cement, and bitumen or other elastic medium being not yet. Each of these has its advocates and each has its strong and weak points on which stress is laid in turn, and until time has been given for the study of some of the more recent proposals it would be idle to hope for unanimity, highly desirable though it be. Thus, the use of sand in the joints, establishing a condition of homogeneity with the slightly yielding cushion, tends to prevent the "noisiness" often urged as a cardinal objection to brick paving in general, but its want of stability, and the disability under which it labors where street cleaning by pressure sprinklers is in vogue, are potent arguments on the other side. Added to these is its failure to afford anything in the nature of a support to the sharp machine angles of the bricks, or, still worse, the rounded arrises of the re-pressed brick blocks—a point in which few will be found to deny that cement is immeasurably ahead of all known competitors.

The writer of this article was himself prepared to find, on taking up the personal investigation of this matter during the past month, difficulties and disadvantages in regard to this class of joint, only to become assured of having magnified them, in anticipation, out of all recognition when contrasted with the reality. There was, for instance, the possibility that cement grout, unless mixed too thin to be of permanent value as a structural factor, might not flow with sufficient freedom to fill the joints, but he was convinced, both by seeing work in progress and by having existing pavements cut into, that no apprehensions need be entertained in that respect. Again, it has been said that the inevitable result of pouring thin grout onto a sand cushion would be to deprive the grout, on the one hand, of the moisture necessary for a true "set" of the cement, and, on the other, to convert the cushion into a non-elastic medium by its assimilation of the grout. These vaticinations are also disproved in practice—not that these conditions have never arisen, but that they are not necessary and inevitable concomitants of the process, these notes being penned with an ever-present conviction that everything depends upon the methods pursued. Eternal vigilance, the price of a good many mundane commodities, must be counted as an indispensable in everything connected with brick paving, and if ill results have followed a reliance upon more easy-going methods, then, so much the worse for the particular paving concerned. It is confidently asserted, and examination of old pavements bears out the statement, that the effect of the rolling is to drive the bricks down sufficiently to fill the lowermost half-inch or so of the joint with compacted sand from the cushion, thus forming an effectual bar to the absorption of moisture, in appreciable quantities, from the grout. This should be composed of equal parts of first-class Portland cement and clean sharp sand, the latter finer in grade than that used for building. It should be mixed in boxes, so arranged that the work of pouring, from scoop shovels filled thereat, can be carried on across the whole width of the street. Constant movement is essential to the success of the process, which must be repeated until every joint is flushed full to the surface. The first pouring should be as fluid as thin cream, the later fillings being mixed a little thicker, and the passage of the grout will be assisted, in all cases, by the judicious use of a watering can, having a very fine "rose" sprinkler. Just as in ordinary cement work, the grout should be given time to get its first set and then covered with a half-inch coating of sand, especially in hot weather; if the sand be kept slightly damp, so much the better.

Now comes a requirement which is by no means the least onerous of those attaching to the use of cement grout as a filler; it is necessary to allow the completed work to lie undisturbed for ten days if the cement is to be guaranteed against rupture, and it is here that difficulties are sometimes found. Like others, however, this particular obstacle becomes the greater when insufficient energy is displayed in meeting it and, inversely, it can be made into a very small molehill when the necessity for it is recognized from the start. Still, the difficulty exists, and it would be idle to ignore it in any discussion of this class of paving.

Bituminous fillers are not referred to in any detail, because none of them have come under the writer's observation under conditions paralleling those applying to his observations in regard to other jointing materials, that is to say, the element of prolonged use is lacking in the former case. Fillers of this character have, however, done good service in the expansion joints which, as experience shows, it is necessary to provide along the street curbs to take up the spreading arising from fluctuations in temperature. Expensive mistakes have been made by insufficient attention to this detail; the writer was shown, in a middle-western city, many curbs which overhung and some which were crushed and splintered as the result of pressure exerted on their bases by brick pavements, the upper portions having yielded in one direction while the buried parts moved in the

writer, wide cross joints, extending from curb to curb and filled with bitumen, had been left at intervals of twenty-five to seventy-five feet, detracting largely from the even appearance which is one of the merits of brick paving. In other places no provision of this kind had been made or found necessary, and it is at least open to question whether, in the former case, a more liberal allowance for transverse movement, especially at the intersections, would not have furnished all that was required. Some evidence in this direction may be found in the amount of movement observed where connecting streets are not paved with brick or other rigid material, the lateral "play" sufficing, in such cases, to prevent the disturbance of curbs otherwise noted. The question of expansion is important from another point of view, as the arching of the brick covering, which takes place



EAST WAYNE STREET, FT. WAYNE, IND.—PAVED IN 1891, PHOTOGRAPHED IN 1905
(Courtesy of the Metropolitan Paving Brick Company, Canton, O.)

other. To meet this tendency, it is necessary to use a continuous board edging at the curbs, the bricks being laid against this instead of extending to the curb. In wider streets, and at intersections generally, the thickness of one inch at each side must be suitably increased, and care must always be taken to remove the boards within forty-eight hours after the pouring of the filler in order to avoid difficulties due to tightening.

A question presents itself as to the necessity, or otherwise, of providing for longitudinal as well as transverse expansion, this being the more interesting because of a diversity of opinion, based upon different behavior under apparently identical conditions. In one city visited by the

when all other outlets for movement are shut off, gives rise to the objectionable hollow sound noticed when vehicles traverse a pavement possessing this defect. In addition, a succession of alternating movements cannot be set up without breaking the continuity of the structure and admitting water to the cushion and bed—a condition to be guarded against by every possible means.

Much might be written as to the care devoted to the manufacture—a twenty-three days' process—of the product used as a basis for the present discussion. It should at least be pointed out that all idea of clay or similar raw materials must be banished from the mind of anyone taking up this subject, the bricks being made of shale, which requires

to be quarried like stone. Similarly, it would be well to bear in mind that the term "annealed" more correctly expresses the character of the finished product than "vitrified," the firing process being checked before vitrification is produced. This does not imply that any difference in texture prevails as between different parts of the brick; on the contrary, nothing is more striking than the uniformity of the entire substance, a fact which has an important bearing on the wearing quality of the pavement. This is shown by the condition of streets laid as long as seventeen years ago, the only effect of the wear by heavy traffic having been to render the surface more even than when first laid, the appearance being decidedly improved without any deterioration of the "footing" qualities beloved of horses and their drivers. What may well be regarded as a severe test in this respect is found in paving where, for many years, express and other teams have been tethered, the only result of the horses' pawing being a slight show of wear at these points.

One word as to the matter of maintenance may not be

out of order. Properly laid, that is to say, with due regard to the several points enumerated above, brick paving yields an almost indestructible street surface and it is therefore of paramount importance that where trenches are unavoidably cut along or across it the work of restoration should be looked upon as of equal importance with the original construction. Many streets seen by the writer bear testimony to a neglect of this consideration, and although allowance must be made for the difficulty of restoring "bond" when a practically monolithic surface has once been disturbed it would be wrong to admit that the leaving of unsightly and uneven gashes in the pavement is other than an avoidable, not to say wanton, detriment to an important part of a city's equipment. In some cases, enough was seen to justify the conviction that the city, rather than the corporation concerned, should be endowed with power to take such restoration in hand, the cost being, of course, debited to the latter, but a discussion of that point would extend the present article beyond limits already overstepped.

THE FILTRATION OF WATER

THE inclusion, in the proposals now before the citizens of New York, of a scheme to filter the entire volume of water supplied to that city has directed renewed attention to the various methods pursued to that end. Reference was made, on page 118 of the September number of this journal, to some of the more general aspects of this subject, in connection with some apposite utterances by Dr. Darlington, Health Commissioner to the city, and his official report contains matter of interest to municipal authorities throughout the country. He shows, by reference to what has been done elsewhere, particularizing the "elaborate and conclusive investigations" of the Massachusetts State Board of Health, that New York is on the danger line as regards the pollution of the drainage area from which its water supply is derived. While insisting upon the necessity for obtaining more effective control of this area, with a view to the elimination or diversion of pollution, he indicates his disbelief in the finality of that measure, citing the example of Liverpool, England, where the supply is carefully filtered though drawn from an almost uninhabited region of the Welsh mountains. As bearing upon the undoubtedly large expenditure involved in the filtration of the city supply, he points out that "the enormous consumption of bottled spring, artificial and imported waters is largely an indirect tax upon the people," and that the poor cannot afford to pay, through that channel, for what ought to be supplied by the municipal government without special charge.

The history of water filtration dates back to the year 1829, when James Simpson, an eminent waterworks engineer, constructed the first sand filters for the Chelsea (London) Water Company. The one object aimed at in their design and operation was the removal of suspended matter from Thames water, and their success was such that the filtration of all supplies from that source was made compulsory some

years later. The use of sand filters spread to other countries, the first American example being built at Poughkeepsie, N. Y., in 1872. In Germany, the regulations of the Imperial Board of Health practically render the filtration of river supplies obligatory.

Many modifications have been effected in the details and operation of sand filters since their introduction seventy-six years ago, as it is no longer considered sufficient to remove merely the suspended matter, as rendering the water better in appearance and more palatable to the user. An improvement in the chemical constitution of water is not only desirable in many cases but experience has shown it to be easily attainable. The rate of filtration, as measured by the vertical descent through the sand, has been gradually reduced until anything over four inches per hour is considered excessive in ordinary cases. This is equivalent to the passage of about 2,600,000 gallons per twenty-four hours to each acre of filter, so that, with American rates of consumption, an acre would not suffice for a city of more than 25,000 inhabitants, irrespective of the reserve capacity which it is necessary to maintain for cleaning, renewals and contingencies. It may be said, in fact, that the chemical purification effected by sand filters has long been regarded as of far greater importance than the original removal of turbidity and, in the same way, the chemical side of the case has now given way to the still more important results in the removal of bacteria.

It required a disastrous epidemic of cholera in the German city of Hamburg, in 1892, to bring home to the average mind of what filtration is capable in this respect. The river Elbe, the source of the water supply of that city, became contaminated by the cholera organism and transmitted the disease to the inhabitants through the medium of an unfiltered water supply. The adjacent city of Altona,

forming practically one community with Hamburg, derived its supply from a point eight miles down stream, using sand filters because of the recognized pollution of the river by 800,000 people, and thus occupying, except as regards the provision of filters, a much worse position than Hamburg, whose supply was abstracted at a point above the city. The result, broadly stated, was that Hamburg, with its unfiltered water, had 263 cases of cholera and 134 deaths in each 10,000 of population, while the corresponding figures for Altona were respectively 38.1 and 21.3. The deaths in Hamburg alone numbered 8,600. This is only one instance out of many which could be cited as affording cumulative proof of the ability of sand filters to mechanically arrest disease germs.

Filter beds are expensive to construct and a considerable annual outlay is necessary for their maintenance and operation. The former consideration is especially onerous in countries having severe winters, as it is then necessary to cover the filters, at a heavy increase in cost, the plant at Albany, N. Y., being the finest example of this type. Owing to these and other causes, American engineers have always shown a disinclination to adopt filtration unless as an extreme measure, and encouragement has thus been given to the evolution of a different type of appliance. What are known as mechanical filters depend for their efficiency, not upon the slow passage of the water, but upon the provision of better methods of cleaning, and in many cases the actual filtration is preceded by settlement or coagulation, or both.

It is a long stride from the use of alum, by a Chinese coolie, for precipitating the fine suspended matter dipped from the edge of an alluvial river, to the installation of the elaborate plants now becoming a feature of waterworks practice in many American cities. Mere settlement, in storage basins, has long been employed as a preliminary to sand filtration, the large impounding reservoirs of English waterworks lending themselves admirably, though as a merely accidental adjunct, to that process. There are many waters, however, of which the Mississippi may be taken as an extreme example, which are not amenable to successful treatment on these lines, and the use of a coagulant—alum being that most generally used—has to be resorted to in such cases to effect the desired precipitation. Lest any misconception should exist as to the danger of alum passing forward with the potable water, the working of the system may be explained. The alum, regulated as to quantity by

the character of the particular water, unites with the carbonate of lime present in it, and forms a new compound, having the gelatinous characteristic of white of eggs, the use of which for settling coffee is too familiar to require any description. The alum can be added either in tanks, as at Youngstown, Ohio, or taken up by the water in its passage through a small mechanical mixer, as at Tarrytown, N. Y., the latter works having recently been visited by the writer. Both plants are of the type known as the Federal Filtration System, of which Mr. William M. Deutsch, 141 Broadway, New York, is the patentee, but the latter is especially fortunate in being in charge of Mr. D. S. Merritt, Superintendent, who combines in one personality the training and experience of a civil engineer, a chemist, and a bacteriological investigator. At these works an effectual remedy has been found in this system for the offensive taste and dangerous qualities of the water formerly supplied to 5,000 persons, while the appearance of the water, as now delivered to the consumers, bears little relation to that of the crude supply. A grain of alum to the gallon, equivalent to the treatment of 7,000 gallons to a pound, costing less than a cent, is the chief factor in this transformation, although the cost of the plant, about \$30,000, has of course to be taken into account. Of this sum, about \$17,000 represents the cost of the filter installation, complete in all its parts. The water is forced through steel cylinders containing the filter sand, a pressure of 130 pounds per square inch being employed. The arrangements for securing a daily washing of the filtering material, by reversing the flow of water, are of the most complete character, a special form of strainer being used so that air can be combined with the wash water.

The adoption of filtration, irrespective of the type decided upon in a given case, gives rise to some considerations affecting water supply in general. Foremost among these is the evident desirability of restricting the volume to be treated, waste which might be allowed to go on in the case of an abundant supply, costing nothing after its acquisition, assuming a different complexion when filtered water, costing money, is in question. The introduction of the meter system, which it is not intended to discuss in this connection, is the method usually resorted to and is peculiarly appropriate to the purpose, seeing that the improvement of the water, by effective filtration, greatly facilitates the adoption of meters in cases where the unfiltered supply would cause serious trouble with these recording appliances.

ACETYLENE LIGHTING

A COMPARATIVELY new invention when contrasted with other popular methods of lighting, acetylene gas continues to increase in popularity as an illuminant and is constantly being more generally employed. The German Acetylene Association, the leading organization of the kind in the world, has recently given out important statistics, gathered with great care, which fully establish the truth of this statement. These statistics show that there are about 75 places in Germany, 202 in the United States, 16 in the United Kingdom

and 19 in the British colonies provided with public lighting supplies. In Germany alone there are 25,000 smaller installations. So new is this great industry that there is small uniformity in the employment of the gas in various countries. Incandescent mantels for acetylene are extensively, almost universally, employed in Germany, where they give great satisfaction, but are practically unknown in this country, and the practice of purifying the gas varies widely. The success of acetylene lighting is no longer in doubt.

WATER METER RATES

THE November number of THE MUNICIPAL JOURNAL contained, on pages 215 and 216, an abstract of the report on meter rates presented to the recent Convention of the New England Water Works Association by the special committee concerned. The following contribution to the discussion of the report, by Mr. Clemens Herschel, the well-known hydraulic engineer, is of so comprehensive a character as to require no excuse for its reproduction.

As the Committee on Meter Rates has especially desired that its suggestions be discussed and criticized, the following is submitted. It has been written out, so as to give the careful attention to the subject which its importance deserves.

Very slowly a reform in water rates, made possible by the invention of house meters that can be manufactured at a moderate price, and by their improvement until they have become marvels of mechanical perfection, is taking place. But discussions such as this keep up the interest, and sometimes, and in most unexpected ways (as writer of this could testify), help on the good work.

Simplicity of operation, under the established water rates, appears to the writer to be of prime importance, and to attain this in the greatest degree seems to him to be reason enough for rejecting the plan of front foot assessment described in the report of the committee.

The substance and service furnished and to be paid for consists of water, under pressure, delivered into the consumer's premises. It is valuable not only as water, but also as an ever-ready safeguard against losses by fire—this last being of value, even though no water be actually drawn for a long term of years.

Water rates may, therefore, very properly consist of two parts: water supplied, and water held ready for extinguishing fires. Water actually used for extinguishing fires is so small in amount during the year that it does not disarrange the accounting to omit it from charges to be made.

We have then the insurance saving to the community by the presence of water under pressure, by hydrants, etc., which may well be a common charge to the whole community, to be paid for out of the tax levy, in a lump sum or as hydrant rentals; and, secondly, water delivered in varying quantities to consumers.

Now, why it should make any difference to the water department what use the consumer makes of the water received, or where he uses it, the writer does not see, except in cases of a scarcity of supply, when luxurious uses—lawn-sprinkling, for example—may, by exercise of police-power, be prohibited altogether, for the purpose of preventing the failure of any citizen to receive a necessity of life.

The foregoing being accepted, we next arrive, naturally, at the selling of water by measure, or by meter. The writer's conception of a water meter is an instrument that will enable the total annual cost of a water supply (less

hydrant rentals received) to be equitably distributed among its beneficiaries. Everything hinges thence on upon people's ideas of what constitutes an "equitable" distribution of this annual cost among the water consumers. And this, being an off-shoot of the great subject of taxation, gives room for opinion and for argument.

To the writer there is but one simple way—to charge by quantity used and wasted; that is, "consumed" on the premises.

If manufacturers, especially such as use large quantities of wash-water, are to be favored, as an inducement to settle in the community or not to leave it, two ways present themselves for exercising such favoritism—their taxes may be remitted in whole or in part; or the principle of a sliding scale for water rates, based on quantity consumed, can be introduced.

The business of booming a town by means of charitable bequests in aid of coming or existing manufacturers should not, however, be confounded or mixed up with the distribution of the annual cost of the water supply among those who receive water.

If it costs \$50,000 annually to supply 1,000 million gallons of water, this makes the cost per million gallons to that town \$50. And if anybody pays only \$30 for his million gallons of water consumed, then somebody else must pay the other \$20. Shall it be the other water consumers, or the tax levy of that town? As a public or communistic enterprise, thus to relieve present, or to tempt intending resident manufacturers, there would seem to be more reason for meeting such charitable expenses from the common tax levy than for saddling them upon the water takers alone.

For municipal water departments, this is not a parallel case to making a difference between wholesale and retail rates for an article offered for sale, for the reason that in the case of such articles a profit is to be arrived at; and wholesale rates, though they include a smaller profit per unit of measure than do retail rates, yet produce more of a profit in the aggregate.

But municipal water rates are not based on, or intended for, the making of a profit. Their aim is merely to distribute in an equitable way, after the manner of mutual companies properly managed, such as savings banks, etc., the annual cost of carrying on the business, among its beneficiaries.

Should, however, the sliding scale of water-rates, from retail to wholesale quantities, be adhered to in the case of private water companies, or in the case of municipal water works who wish to range themselves in the company of sellers at wholesale and retail rates, such a sliding scale, diminishing with an increase of consumption, can readily be made to favor the large consumer. In such cases, the sliding scale should not include a temptation to consume more water for the purpose of attaining a lower rate and lower aggregate charge.

An objection to meter rates, often heard from, relates to low-priced tenement houses, where waste is liable to go on

in excessive amounts, and is not brought home to the wastrels by the one meter in use as it is where only the family occupies the house; hence great outcry and objection from the owners of such tenements. But the remedy is clearly the use of more meters; one on each floor, or if need be, one to each family; precisely as the gas company manages such cases. There is no way to gain the active and continuous co-operation of the public in keeping their plumbing in order, and in shutting off the water when it is not being drawn for use, except by causing the result of any neglect on these lines promptly to appear in the next quarterly or monthly bill for water used and wasted.

It is to be regretted that the report of the committee gives renewed currency to the exploded fallacy that, with a gravity supply, "it costs no more (within certain limits) to furnish a large amount of water than a small one." This is equivalent to saying that wastefulness costs no more than thrift, and the day when this shall be true is surely as far distant as the suspension of the action of the force of gravity, or of that of any other law of the universe. The statement made by the committee is apparently—but only apparently—true for one year of operation, but is evidently not true for ten or twenty-five years, or longer. Working on the basis first named has called for tens of millions of dollars of expenditure for "extending the water works" in the United States, when for ten and twenty-five years, even for fifty years, such expenditures should have been uncalled for and unnecessary. It also breeds a spirit of wastefulness in any community, with an article costing money to procure, which later it is exceedingly difficult again to remove. It has been largely responsible for that very disinclination to use reason in the management of water works, which the report of the committee aims to annul. No city receiving and paying for water by meter would ever think of putting forth such doctrine.

It is well to remember that cases are on record in which, by nurture of the spirit of wastefulness, cities have attained a consumption on certain days of fully ten, and even twelve times the quantity which was ample for all their needs, and it requires no argument to prove that such cities have paid, and are paying, much more for water than they should, be it furnished by gravity, or by pumps, or both.

House meters are necessary for the prevention of waste on the consumer's premises. Equally necessary for the prevention of wholesale waste out of street mains and conduits, and, generally, to enable a proper accounting to be made of the whole operation of the works, are Venturi meters

on these mains. The experience of the Metropolitan Water and Sewerage Board of Massachusetts should be conclusive on this point; not to mention that of the East Jersey Water Company, the details of which (this being a private water company) are, however, not so easily procured.

Nor can a counting of pump strokes take the place of a meter record, whether this be an occasional one, or a graphically continuous one. In fact, it has repeatedly been shown that the only way to keep a pump constantly in order is to have its pulse felt from time to time, or daily, by a meter; and to make repairs on valves or do other overhauling as the meter shows the need of them. Without such watch upon the pump, counting the strokes may result in a variance from the truth of anywhere from 20 to 40 per cent.

As a final consideration, and with reference to flexibility of rates from one year to another, the writer suggests discounts on bills paid, or to be paid, precisely as this end is attained by the general tax levy, or in the management of mutual savings banks, or mutual life insurance companies. It is very true that it is difficult to foretell the income and expenditures of a water department, and, generally, that the historian has a clearer field than the prophet. But such estimates need be no more embarrassing to the water department than they are to the other communistic enterprises above named.

All perfection in this world, or approach to it, is generally reached by successive steps of improvement and of approximation. Let any fair and competent estimate be made, therefore, of annual income and expenditures for the ensuing year; make an "overlay," precisely as the tax levy does, to prevent shortage, and then let the water takers have the benefit of the surplus, either at the office in cash, or as a discount on the next quarterly bill, or annually. Such annual rebate might even be made a popular feature of the conduct of the water department, awaited with interest, and no doubt meeting praise and blame, according to amount of cash thus put into the pockets of the water takers—where now there is blame only.

We have thus arrived at the conclusion that waste should be prevented and water paid for as gas or the electric fluid is managed and paid for; namely, strictly by measure of substance consumed on the premises through the meter of the party furnishing it, at uniform rates to all consumers, with the additional and superlative attraction that all profit (or in case of private water companies, all excessive profit, if any), made during any one year is returned to the customer, pro rata, at stated intervals.

COPPER SULPHATE TREATMENT

FOLLOWING up the discussion on the treatment of water supplies with copper sulphate, which was a prominent feature of the recent New York Convention, the New England Water Works Association has sent out a circular letter, inviting those who have had experience in this line to fill out a blank form, the object being to publish tabulated returns based on the data received. It is intended to do this in the December issue of the Association's Journal, but the matter will be kept open for further experience, a supple-

mentary table being contemplated for a later date. The information sought includes a complete history of the processes to which the water has been subjected in each case, and it is to be hoped that everyone who has had opportunities of experimenting in this field will apply for the necessary blanks and add his quota to the accumulated information. The forms will be furnished on application to Mr. Charles W. Sherman, Editor of the Association's Journal, 14 Beacon street, Boston, Mass.

MUNICIPAL OWNERSHIP IN NEW YORK CITY*

THE recent histories of almost all New York's public service corporations follow the same general lines. First, a municipal utility is cornered, by methods no matter how piratical, and competition is suppressed. The properties (including franchises) are then recapitalized at considerably more than intrinsic worth and of course more than cost. Large holdings of the new securities are distributed among life insurance companies, fire insurance companies, trust companies, and other financial institutions controlled by the insiders, who, however, retain a safe working control. A comfortable minority interest is disposed of to the investing public at luxurious prices in exchange for real money; but the actual majority interest is carefully concealed. Handsome returns by way of interest and dividends are paid to the holders of the inflated capital by charging the public extortionate rates for the service rendered, and a high stock market quotation is easily maintained. Any effort to obtain a reduction of rates by legislation is met by the liberal use of those blandishments that appeal to the average legislator, and by the cry, "You are imperiling the investments of widows and orphans," and by all the deceptive sophistry that high-priced legal talent can devise.

Is it to be wondered at that the estates of dying politicians contain blocks of such securities or that the common people turn instinctively to municipal ownership of all utilities?

It is significant that most of the great bridges were started as private enterprises, but had to be completed by the former city of New York or the city of Brooklyn, or by both together. The New York and Brooklyn bridge was started by a private corporation. The two cities were allowed to subscribe for stock and did so, and later obtained representation on the board of directors; but in 1875 the company sold out and the bridge was brought to completion as a municipal enterprise by city officials.

The idea of a Williamsburgh bridge and of a bridge on the site of Manhattan bridge was first privately conceived. The East River Bridge Company obtained for the purpose a most generous charter from the notorious Legislature of 1892, but started at the wrong end by trying to build in Manhattan an elevated road as a bridge approach before commencing work on the bridge itself. After the courts had defeated this little "game," the Legislature created the Williamsburgh Bridge Commission, representing New York and Brooklyn, which Commission promptly purchased at private sale the right of the East River Bridge Company to locate and construct the Williamsburgh bridge, and thereafter this structure was completed as a purely municipal enterprise. The Manhattan bridge and the Blackwell's Island bridge are being built by the city, private corporations having failed to do so.

A favorite argument against municipal ownership is that progress on municipal undertakings is unnecessarily slothful; but how unprogressive private capital is at times!

But municipal ownership under present civic and financial conditions is a grave problem. It involves not merely the acquisition of the title to the physical property and franchises, but also the operation of those properties in an efficient manner.

In the case of New York's bridges this phase of the question slaps us right in the face. With a few exceptions there are no privately owned bridges in the city used for public purposes. All bridges used for street surface cars, foot passengers and vehicles belong to the municipality.

Municipal "operation" of a bridge includes not merely maintenance, keeping clean and in repair, but also the operation of a railroad for the traveling public. No bridge in the city is now municipally operated, wholly. The New York and Brooklyn bridge originally was, and that was good and efficient operation, even though the "soft places" at the disposal of the Trustees were sometimes used to supply political favorites with pocket money. A Tammany Bridge Commissioner in 1898 turned the road and its equipment over to what is now the Brooklyn Rapid Transit Company.

On the Williamsburgh bridge, trolley cars are privately operated. The demand for through transportation without change has been used to prevent municipal operation, just as in the case of the old bridge it was used as an excuse to do away with such operation. On the old bridge we have through transportation by elevated trains, but only at certain hours of the day, and on the new bridge there are privately operated "shuttle" cars which do not leave the bridge property. The city could just as well operate these "shuttle" cars itself, especially as the corporation operating them has refused to pay its rent.

There are as yet no elevated trains on the new bridge. The East River Bridge Company, when it sold part of its "rights" to the Williamsburgh Bridge Commission for \$200,000, carefully stipulated that the bridge should be so constructed as to accommodate the Brooklyn elevated trains. The estimable gentlemen of the Bridge Commission were in the railroad business. The bridge was so constructed; hence, the aerial monstrosity at Delancey and Clinton streets, Manhattan, and the recent agitation for an elevated loop between the bridges. The antagonism of two great public service corporations toward one another prevents the people from obtaining the full use of the people's \$22,000,000 structure.

In 1903, the Board of Estimate and Apportionment and the Board of Aldermen granted to certain railroads a franchise for Macomb's Dam bridge over the Harlem River. This was a "cumbersome" operation and the franchise was filled with "awkward" provisions for the protection of the city. No such "mistake" is to be made with the fine new Vernon Avenue bridge over Newtown Creek, connecting Brooklyn and Queens. Tracks have already been constructed on that bridge for the Brooklyn Rapid Transit Company, and it is rumored that the Tammany Bridge Commissioner has already delivered to that company another

* By Edward S. Brownson, Jr., in the "Woman's Municipal League Bulletin" for September.

of his famous secret leases. At the Queens end of the structure, however, stands Mr. Belmont with a powerful street surface railroad and title to all land available for a suitable bridge approach.

Municipal "operation" of the bridges is, therefore, to a great extent, but one element of the far more serious problem of the municipal ownership and operation of the street railroads, surface, elevated and underground.

Municipal ownership of New York's ferries has always been limited to the ownership of certain approaches and of the franchises. Some approaches and the equipments have been privately owned and the ferries have been privately operated under leases for terms of years which have been either sold to the highest bidder or granted without competition by the Commissioners of the Sinking Fund. The results reached have been grand arguments for full municipal ownership and operation, except where the ferries have been merely adjuncts for great railroads. Except in those cases, the service rendered has been abominable and the equipment disgracefully old and poorly maintained. The Union Ferry Company some years ago treated itself to a financial operation whereby much of the "juice" was squeezed out of it, and little was left for betterments. The competition of the city's bridges prevented it from charging exorbitant rates. Some of its boats were gunboats in the civil war. The service and equipment of the Staten Island ferry are beyond description; but the city has bought the Staten Island approach, is reconstructing the Manhattan approach, and has purchased a fleet of fast, up-to-date boats, and proposes to operate them itself under the control of the Commissioner of Docks and Ferries.*

The result of this experiment will be very instructive. Can municipal operation of a public utility be expected to

* The service was inaugurated October 25, as noted in a brief article on "Progress in New York City," on another page.—[Ed., M. J. AND E.]

be successful under the control of a public official who, being appointable and movable at pleasure by the Mayor, may be selected not because of fitness, but because of subserviency to a political boss? Will this fine new ferry, with its splendid equipment, be so wretchedly and expensively managed that in a few years it can, without public protest, be given away to private capitalists for an insignificant consideration? Is the history of the Philadelphia gas plant sufficiently vivid in the public mind to prevent such a disaster?

By what method can the municipality secure and retain faithful representatives who have only the city's good and that of its common people at heart? We have observed bipartisan appointive boards break their trusts through both mis-feasance and non-feasance, and we have concluded to discard them as efficient municipal agencies. We have seen an appointive commission with many independent powers, including the unusual power to fill a vacancy in its own membership, accomplish the unheard of result of building in a splendid manner a \$50,000,000 underground railroad *on time*. We shall watch with intense interest the manner in which the new Water Board, with its equally great powers, except that of self-perpetuation, performs its tremendous duties. We have seen heads of departments, appointable and removable at pleasure by a Mayor who holds office for a short term of years, allow great public works to fall into decay. But we have not tried in New York the protecting of the heads of the ordinary administrative departments from removal for political reasons. We have never required any Mayor to reinstate such official upon its being proved to a court and jury that the removal was made in "bad faith," at the behest of some political boss or machine, and not for the good of the city and its common people. Why should not our next Commissioner of Docks and Ferries, upon whose faithfulness will depend the successful operation of the new Staten Island ferry, be ensured such protection?

WATER METERS AND FILTRATION

In a recent report to the Mayor and Council of Kansas City, Mr. Elmer N. Powell, Assessor and Collector of water rates, referred to the advantages derived from the 10,000 meters now in use, and urged that water-takers should buy meters from the city, the latter being able to sell them at a reduction of 40 per cent. We venture to disagree with him on this point, believing that all meters should be owned and controlled by the water authority, the question of repairs, alluded to by Mr. Powell, being also a matter for that body, irrespective of whether the cost be charged as a separate item or included in the water tariff. On the general question of metering supplies, the following extract from the report, having a wide application, is confidently commended to the study of local authorities:—"In my judgment, the only avenue to cheap water is through the general use of meters. The meter will lead to the equalization of rates. It enables the prudent householder to obtain an ample supply of water at a reasonable cost and it curbs the extra-

gant, improvident and careless householder by demanding payment for water so wasted. The city of Milwaukee is an example of the efficacy of the meter in reaching cheap water. The city has 40,000 metered services and is selling water to all consumers at four and one-half cents per 100 cubic feet, or 748 gallons, which means about six cents per 1,000 gallons. . . . The policy of waste and the consequent outlay in the way of operation and the attempt to keep pace in pumping and settling capacity will not bring cheap water in years to come. The necessity for filtration becomes more pressing by reason of sewage and other deleterious matter, often deliberately placed in the sources of supply, and the cost of meeting this essential to health is already taxing the financial capacity of the large cities. If the factor of waste is ignored and committees are compelled to filter water for fire, sewer and street washing as well as drinking purposes, it will be next to impossible to place a limit on the expense."

THE USE OF ROAD ROLLERS

MR. A. W. CAMPBELL, Deputy Minister of Public Works, Ontario, Can., well known as an authority on road construction and maintenances, discusses the use of rollers in "The Municipal World" (St. Thomas, Ont., November) with special reference to the recent purchase, by the County Council of Wentworth, of a second steam roller. Omitting the introductory paragraph, the article is as follows: "At first glance, those who are not conversant with the results of rolling and proper methods of road building are apt to consider the rolling of roads a luxury. On the contrary, it is a means of economy, and wherever tried, proves most satisfactory. It does more than merely hasten the forming of a smooth road. It enables the construction of a much more durable and permanent road, and is a great saver of road metal. In Wentworth, where there is little gravel, and broken stone is used almost solely, the latter consideration is a most important one. Rolling is not so effective when the roads are dry, and by having two, advantage can be taken of wet weather, instead of using a sprinkling wagon.

Every good road has two essential features:

(1) *The Foundation.*—The earth sub-soil is firm, well-drained naturally or artificially, making a strong, unyielding foundation.

(2) *The Wearing Surface.*—The wearing surface is a smooth, hard and compact crust, which resists wear, sheds water readily, and distributes the concentrated wheel load over a greater area of sub-soil.

In carrying out these two principles, a heavy road roller is of the greatest value, and for economical, durable and serviceable roadmaking is indispensable. A road should first be properly graded, crowned and drained. The roller should then be used to consolidate this earth sub-soil so that the gravel or stone placed on it will not be forced down into loose earth, but will form a distinct coating. When this foundation is prepared, the metal can be placed over it, rolled and consolidated into a distinct crust.

IF A ROLLER IS NOT USED

If the gravel or other road metal is dropped from the wagon loosely on a soft earth foundation, water passes into the sub-soil as through a sieve. Wheels passing over the road when in such a condition at once sink into and rut not only the gravel but the earth beneath. Water is held in the ruts, and each succeeding vehicle renders their condition worse. The road thus becomes less durable, since the gravel and stone, being mixed with the earth from beneath it, forms, when finally consolidated by traffic, a weaker crust, dusty in summer, muddy in wet weather.

Where a roller cannot be used, special care should be taken to keep the wheel tracks filled until they are thoroughly hardened, drawing the metal into them from time to time with a rake, or the grading machine. This, however, is only a partial substitute for a roller.

The consolidation of loosely spread stone or gravel by traffic is a slow process, causing much inconvenience to

travel, during which the earth of the sub-soil becomes mixed with the stone. Earth intermixed with stone prevents the strong mechanical bond which clean metal will assume when the stones are wedged one against the other by a roller. The particles of earth, when wet, have a lubricating influence on the stone, and under the action of wheels the surface is more readily broken up. By the use of a roller the earth sub-soil can be first thoroughly consolidated. The stone should be placed on this foundation in layers, and each layer well compacted. In this way a smooth, durable, waterproof coating of stone, free from earthy material, can be laid over a firm foundation. A road should be made for traffic, not by it. To leave loose gravel and stone in the roadway is neither an agreeable method of constructing a road, nor will it produce the most durable road.

FURTHER BENEFITS

Among the further benefits to be derived from the use of a roller on country roads are:

- (1) A good road is at once made for vehicles.
- (2) A dirt track is not made by vehicles near the ditch to avoid a pile of loose stone or gravel, so that the side of the road is not cut up in such a way as to interfere with surface drainage.
- (3) Traffic is not inconvenienced in the fall by being forced to drive through loose gravel or crushed stone.
- (4) The gravel or stone is not forced down into the sub-soil by the wheels and feet of the horses, is not churned and mixed with the earth, and there is in this way a great saving in the amount of metal needed on the road.
- (5) There is a great saving in labor, and the roller is exceedingly useful in repairing the roads.

CROSSING BRIDGES

The use of heavy rollers in some townships is urged against because of the insufficient strength of bridges and culverts, and while valid in some instances, the objection is liable to exaggeration in others. Weak wooden bridges and culverts could in many cases be temporarily strengthened sufficiently, while in others they could be entirely avoided by first completing the rolling on one side and then passing around a block or so to commence work on the other.

USING THE ROLLER

The amount of rolling which can be done in a day varies according to the quality of metal used, the kind and amount of binder, the thickness of the layer of stone rolled and the weight and type of roller. With broken limestone, rolled by a twelve-ton steam roller, the amount of stone compacted will average from forty to fifty cubic yards in a day of ten hours.

Rolling should commence at the side of the road, approaching the center gradually, helping to form a crown. If the roller is first passed over the center, the loose metal is crowded out, and the tendency is to flatten the road. The earth foundation should be rolled, and each succeeding layer

up to the top dressing. When the latter is put on, the rolling should be continued in wet weather until the road is thoroughly compact and solid, able to resist, without displacement, the heaviest load passing over it.

There are different kinds of rollers. The horse rollers, weighing from six to eight tons, will do if a steam roller cannot be afforded, but the horse roller is not sufficiently heavy for the best results. It has to be used much longer than the steam roller. The feet of the horses, in exerting sufficient strength to move the roller, sink into and disturb the shape and quality of the roadway, while on hills it is at a disadvantage.

The steam rollers are of various weights, ranging from eight to twenty tons. Rollers of fifteen tons weight are those generally used by the towns and cities of Ontario. The cost of horse rollers is usually about \$90 per ton, or from \$400 to \$600 each. Horse rollers are, however, generally so constructed that the weight may be increased by iron castings, so that a roller of five tons may be made to weigh about eight. Steam rollers cost about \$3,000. For

operation, a steam roller, with two teams, will cost \$10 a day, including interest and depreciation, but will do several times the amount of work done by a horse roller, so that the saving in operation is considerable.

COST PER MILE PER YEAR

The objection to the purchase of steam rollers by townships is their cost. It is, however, but a matter of time when this will be overcome. The price may or may not be reduced, but in the meantime an appreciation of good roads will grow, the value of good roads will be more realized, rural population, wealth and traffic must increase, so that all influences will tend toward the gradual use of rollers by townships.

A roller, at first sight, may appear to be an expensive implement. But this should be considered in its relation to the work it will perform: The cost is not confined to one mile of road, but is spread over a great many miles; it is not used in one year, but will last for many years. The cost per mile of road per annum is but slight, and the saving through greater durability will return the outlay many times.

CONTRACTS VERSUS MUNICIPAL LABOR*

By George B. Pike, City Surveyor, Manistee, Mich.

THERE are two systems in use in the performance of public work: the contract system and the municipal labor, or day labor system as it is sometimes called. In the contract system public work is usually awarded, under competitive bids, for furnishing the materials and performing the work to be done, to some contractor. In the municipal labor system the materials are purchased directly by the city officers and the work performed by city laborers. A city may, providing the law does not prohibit, adopt either system exclusively, or it may do certain work with one system and other work with the other system. Both are business methods. Both have been tried and found satisfactory. Either system may be more or less a failure under dishonest or poor management. The public improvements of a city should be conducted strictly along honest business lines. The sums of money expended for the purpose of city improvement are enormous, and the questions of economy and perfection of work are important considerations.

No city should undertake to do work by the municipal labor system without first ascertaining if it possesses the proper man to superintend and direct it, and the proper tools and appliances with which to perform it, or at least determining if such are obtainable. These are important considerations and enter very largely into the cost and perfection of the work performed.

An experienced superintendent is the first requisite. One who has actually done similar work and done it well is to be desired, and compared with one who has not he would likely be able to effect a saving of more than the cost of his services in one ordinary piece of work. The actual value of the services of tools and of laborers depends largely upon the manner in which they are directed or superintended.

There must be good management or the business will not prosper.

In the matter of tools and appliances the amount of work to be done should be considered when deciding upon the method of performing it. We should determine whether there is now, or will be in the near future, enough of this class of work where these particular tools may be used to warrant their purchase by the city. If not, then the contract method is desirable. Tools are like horses—we should have a place in which to keep them, they should be made to earn their keeping, and should not be purchased unless there is need for them. True, they do not have to be fed when not in use, but they depreciate greatly in value when not properly cared for.

In purchasing tools the experienced superintendent is again valuable, and his advice, if followed, will likely result in a saving to the city.

In the contract system both these items, superintendent and tools, are involved in any public work, and their cost, or at least the cost of their use, is included in the contract price. We may say, then, that they are paid for from the public funds no matter which method is adopted for doing the work.

An important matter directly affecting the cost of the work is the price paid for material. Can a contractor buy material cheaper than a municipality? It is an open question, but the writer believes not. In general, prices to a city are as cheap as to a contractor, especially when bought direct from manufacturers, unless there is a strong sentiment in favor of patronizing home merchants or dealers, in which case the dealers must have a profit.

A city may purchase material in either of two ways: It may advertise for bids and award to the lowest bidder, or it

* From "The Commonwealth."

may buy by bargaining in the open market. Sometimes one method will be preferable, sometimes the other. In the operation of this department the best business acumen which the city is able to command should be brought into use. In securing the services of an engineer or superintendent, in the purchase of material, tools and appliances, we should remember that cheapness does not always constitute economy. In the expenditure of the people's money for the purposes of public improvement, in order to give the best results, to insure the permanence of the work, we should buy the very best possible under the circumstances.

A serious problem in the municipal labor system is the problem of labor. In this department organization must be perfected and maintained. The laborers must be sorted, as it were, and the proper man put in the proper place. It is not difficult to discern the good workmen, but it is difficult to get rid of the poorer ones. The poorer workmen are very liable to, and they often do, look upon city work as a pension job, and to think that they can hold their position regardless of the amount, or quality of work done. In the smaller cities they have more or less influence in a political way, and if discharged by the superintendent for shirking their work, or for any other cause, they generally hold a grudge against him, they slander him and use their influence against his reappointment and to his detriment in all possible ways. However, a good superintendent will disregard this mode of action and will require a fair day's work for a fair day's pay, treating all with respect and becoming familiar with none. If the "old soldiers" are employed upon the work, they should be given in daily wage what they earn and no more. It is wrong for an alderman to insist upon the employment of this class of labor at the full rate of wages in order to gain political advantage.

If the best results are to follow it is necessary that the superintendent have full control of the labor and that in all right doing he be given the unqualified support and backing of the council or committee under whom he works.

In the completed work there should be no discount. It should compare with that of any contractor and not be found wanting. And, again, the degree of perfection depends upon the manner in which it is superintended. There are degrees of perfection in public work, some are better than others.

In the contract system there is sometimes a tendency to shirk the fine parts of a job, to do it just well enough to pass inspection, and if inspection is lax, to slight it. By the fine parts of a job are meant the parts which perhaps are not really essential to its usefulness, but which add much to its beauty, durability, safeness or permanence; in fact, the fine touches. For example, the laying of a foundation at its full required thickness, the smoothness of a brick pavement, the laying of the brick in straight rows or courses, the perfectly cemented joint in sewer work, etc. Under the municipal labor system the writer believes, and his experience bears him out, that a city is more liable to obtain these details of construction than it is under the contract system, and the municipality will be more liable to get what it pays for. The people's money will more nearly purchase in full what it is intended to purchase.

The time and expense of advertising for bids, the formality of filing bonds, both for execution of contract and for maintenance, is done away with under the day labor system. The city must guarantee its own work, and it should be done so good that no repairs will be necessary for the period of the usual guarantee. The writer thinks this is possible in all cases where a guarantee is required.

In any event, if the city performs the whole work in the first place, it will certainly be in a good position to make any repairs which may become necessary, and make them at the proper time.

A contractor's maintenance bond is a very unsatisfactory guarantee. If the contractor desires he may make it very difficult, if not entirely impossible, for the city to enforce it. The only perfect guarantee is a sum of money retained from the final payment to the contractor that will cover the cost of repairs for the full guarantee period, and which may be used, and which is expressly retained for that purpose. In this case the cost of the guarantee most probably increases the contract price.

In conclusion I will say that if a city can obtain the proper superintendent, can obtain the proper tools and appliances, can purchase material at as low a cost as a contractor, can furnish a better piece of completed work, then it is a matter of practicability and economy for that city to adopt the municipal labor system. Should it not at least be able to save the contractor's profit?

A GLASGOW REPORT

MR. D. McCOLL, Superintendent of Cleansing to the Corporation of Glasgow, in his annual report dealing with the year ending May 31st, shows that the expenditure amounted to \$660,000, with a revenue from sales of manure, etc., of \$188,000, leaving a net cost to the city of \$472,000. The functions of the Department include the care of the streets and the collection and disposal of the entire refuse of the city. Some portions of this are cremated in different stations, special mention being made, in the report, of the Crawford street plant, the whole of the machinery being driven and the works and stables illuminated by means of power generated from the refuse. The average cost of

refuse disposal was about twenty-nine cents per long ton, this including railroad freight charges.

A well-known feature of the Glasgow system is the hose-washing of streets, the area washed in the year being 16,250,320 square yards, the cost of which works out at \$3.00 per 10,000 square yards. A total of 362,662 tons of refuse was handled by the Department, an average of 497 men being employed. This is exclusive of the 295 men engaged in the cleansing of "private streets and courts" for proprietors, the cost of this work being reimbursed under the terms of a special Act and not included in the foregoing figures, as would more usually be the case.

SHALL THE CITY OWN ITS STREETS?

UNDER this caption, "Public Opinion," in its issue of November 4, summarizes representative replies to an invitation calling for the views of mayors and others on the question of municipal ownership. The scope of the inquiry is best indicated by the letter of invitation, as follows:

"One of the most important of modern municipal problems is the control of public-service franchises. The methods in use or suggested may be broadly classified as follows:

1. Unrestricted private ownership and operation.
2. Private operation on a long-term lease with some compensation to the city.
3. Municipal ownership and private operation of a short-term lease with adequate compensation to the city.
4. Full municipal ownership and operation under proper civil-service regulations.

"In view of the importance of the problems involved in this question, I venture to ask you if you will not make a brief statement of your opinion for publication on the following points:

1. Which of the above methods of administering public-service franchises seems to you preferable, and why?
2. What seem to you to be the principal advantages and disadvantages of municipal ownership and private operation on short-term leases with adequate compensation to the city? In that case, what would you consider as the maximum length of the lease?
3. In your opinion, are full municipal ownership and operation feasible under present political and social conditions in our cities?"

Mayor McClellan, of New York, referred "Public Opinion" to his speech of acceptance at the Democratic Convention on October 5, in which he laid stress on the fact that "the question of municipal operation is as old as history; the question of municipal ownership is as old as the hills. There is no sentiment about it. It is purely a proposition of dollars and cents. How the community may best be served, whether by the private or public operation of public utilities, must be determined by the man of business, and not by the theorist. The franchise wealth of the city belongs to the people, and should never be parted with. Franchises should be granted only for limited periods on terms most advantageous to the public. . . . The confiscation of private property, even by a municipality, is not yet recognized as Democratic doctrine by the Democracy of New York." Somewhat on the same lines, Mr. William Mills Ivins, the Republican opponent of Mayor McClellan, expressed the belief that, from the academic point of view, municipal ownership is no longer an open question, the public mind being made up on several points. Among these were the fact that these tremendously great sources of wealth, which are themselves created by the community, should be reserved for and belong to the community. Corporations whose franchises have lapsed or are subject to forfeiture should be rigidly compelled to live up to the utmost limit of the letter and spirit of their contracts with the public. No public utility franchise should ever be granted in perpetuity, and those which have already been granted should, as soon as practicable, be acquired for the city upon fair terms, these to include "full and honest payment therefor."

What our contemporary characterizes as "a very cautious

declaration in favor of a modified municipal ownership" emanates from Mayor Jones of Minneapolis, who, while finding his views drifting of late years very strongly towards municipal ownership, with operation under lease by private corporation, is unable to disregard the opinion expressed by Mr. Dalrymple, the Glasgow expert, after a personal investigation of American conditions, political and other. "I believe," he continues, "that most cities may well own, control, and manage their water-works and municipal lighting plants, but when it comes to the much larger proposition of the control of street-car lines, I would be very reluctant to admit the desirability or feasibility of adding this function to our large city government enterprises."

If this utterance be looked upon as cryptic, no such description can be applied to the reply of Mayor Neff of Kansas City, who may be regarded as an unequivocal opponent of public ownership, and is able, at least, to give chapter and verse for his attitude. "I favor," he writes, "unrestricted private ownership and operation of public-service franchises, with the percentage of compensation based on the gross revenue of the operating company. Our municipality owns the water-works franchise, and is very slowly but gradually making a business institution out of it. The obstacles in the way of rapid perfection of the system are purely political. The main one is the frequent change of officers, who hardly get familiar with the business problems connected with the operation of the water plant until their successors are elected or appointed and a new party of greenhorns has the whole job to learn over and go through with again. Furthermore, the ordinary man working for the city has very much less conscience and fidelity than if he were working for a private corporation. I believe the people of Kansas City are opposed to municipal ownership of electric light plants, gas plants, and street railways. Since acquiring the waterworks the question of whether the city should acquire the electric light plant and properties was heavily defeated."

A more undecided position is assumed by Mayor Fleischmann of Cincinnati, who is not at present "what would be called an advance for or against municipal ownership." Under conditions as they exist in most of our municipalities to-day, he is seriously opposed to the idea, believing that before it can be worked out successfully it will be necessary to have a civil service that is both actual and absolute. As matters now stand, entire municipal ownership would mean the continued rule of the party in power; this would be so even under civil service unless the latter were of a character which, apparently, he has little hope of seeing realized. The same guarded and judicial tenor pervades the brief reply of President Eliot of Harvard. He believes that the most feasible and just method of operating public utilities is by a private company on a twenty-five or thirty-year lease, with fair compensation to the city. Municipal ownership and private operation on a shorter term lease he regards as not feasible, on the ground that no responsible company would undertake such a contract, and records an unqualified "No"

to the question, "In your opinion, are full municipal ownership and operation feasible under present political and social conditions in our cities?"

Mr. Clinton Rogers Woodruff, secretary of the National Municipal League, states his position as follows:

"I believe in municipal ownership, meaning thereby that every municipality should own and control all franchises for public and quasi-public services. The question of the operation of the franchise is a matter which each community must settle for itself. So far as Philadelphia is concerned, I believe the public operation of franchises would be better politically and morally. The relation of the public-service corporations of this city to our municipal life has been blighting and corrupting." A still stronger pronouncement in favor of public ownership and operation is made by Mr. Clarence S. Darrow, of Chicago, well known as a lawyer and writer and by his connection with various public movements. His opinions are thus expressed:

"(1) Unrestricted private ownership and operation of public utilities means unrestricted ownership and private operation of the government itself. It can mean nothing else, as the theoretical business of the government is to protect the people against the encroachments of the strong.

"(2) Private operation on a long-term lease with some compensation is better than nothing; but not much better.

"(3) Municipal ownership and private operation on a short-term lease with adequate compensation to the city is impossible; no such thing ever took place, nor ever can take place.

"(4) There is no solution that will protect the people in the ownership and use of their streets, except full municipal ownership and operation. If the city owns and leases to a company to operate, the result is the same as in the New

York subway; the city pays the bills and the company gets the profits. There can be no real municipal ownership without operation. I am not at all sure that civil-service regulations help the matter. Civil-service regulations are like constitutional provisions: they are powerful in the hands of the strong to prevent real reform. Without the right public conscience in reference to appointments they can only be measurably successful. In public affairs civil service may prevent the worst officials, but it absolutely bars the best."

Mr. Hearst, the Municipal Ownership candidate for the New York mayoralty, did not furnish a reply to the questions submitted, but "Public Opinion" quotes the following statement, recently made by Mr. Hearst to Mr. Frederick Boyd Stevenson, of the Brooklyn "Eagle," as indicative of his views:

"First, I believe there should be short leases under the control of the city. We should begin these new moves conservatively and proceed on a business basis, and, in a comparatively short time, we should find the city fully able to operate its subways, and that the profits would go toward reducing the fare and giving better service, instead of enriching a little coterie of men who get the franchises practically for nothing and oft-times sub-lease them, the earnings paying eighteen and sometimes a greater per cent. . . . There is no plan of confiscation in our campaign. Our program is to retain the gas franchises and other franchises that have lapsed and all the franchises that have not been given away and still belong to the people. Certain people laughed at me when I told them that the gas companies could manufacture gas for one-half the prices they are asking now. As a matter of fact, however, when the gas companies got to fighting one another in Boston they cut the price to fifty-five cents a thousand, and then made a profit."

HOUSING IN GERMANY

OUR London contemporary, "The Municipal Journal," publishes the following data in regard to a subject which is elsewhere referred to in our present issue:

In August last the Birmingham City Council sent a deputation, consisting of four councillors, with the Medical Officer of Health and the Clerk of the Housing Committee, to visit several German municipalities with the object of studying the steps taken by those towns for dealing with the housing problem. Berlin, Ulm, Stuttgart, Mannheim, Frankfort, Cologne, and Dusseldorf were visited by the deputation, which gathered a mass of information. As this will take a considerable time to condense and arrange, the full report will not be issued for some time yet, but in the meantime a preliminary report to the following effect has been presented:

TOWN EXTENSION PLAN

Every town of any size in Germany has adopted what is generally known as a Town Extension Plan. This plan contemplates and provides for the future development of the whole of the land within the city boundaries, and settles the direction, width, and nature of the streets, situation of

parks, and public and semi-public buildings, and, generally, the class of buildings to be erected in particular quarters of the town.

The advantage of this method will be obvious to anyone when the haphazard method of allowing English towns to grow is considered. Philanthropists and public men who have been concerned with the acquisition of open spaces after land has risen far above agricultural value, will specially appreciate the wisdom of arranging for parks, playing grounds, and wide streets, before the land is developed for building purposes. There are two types of town extension plans formulated, one dealing with the whole of the area of the city in a general way, and the other dealing with each district in detail. The former of these plans is not published by the municipality, but the latter is made the subject of local inquiry and full discussion, and is published for general information.

This method of laying out towns on a comprehensive and far-seeing plan has now been in operation for many years with most satisfactory results. Landowners frequently assist the authorities in drawing out the plans. By this

means of providing for the wise development of the land from the point of view of the whole community, landowners are preserved from the danger of having their property depreciated by the action of a neighbor whose interests and whose methods of development may be entirely different.

COST OF STREETS, PARKS, ETC.

The procedure in connection with the town extension plans is governed by general laws in the various States, modified by the by-laws in each town. The cost of the land required for streets, and of constructing the streets up to a certain width, is paid by the owners of adjacent building sites. In most cases the parks and open spaces are purchased by the municipality. In certain towns where an extension plan cuts up the land of several owners, the whole of the land is re-distributed in proper proportion among the owners concerned after the streets and open spaces have been provided for. There is a general imperial tax law dealing in the first instance with the distribution of the cost of streets over the building sites, and again with the acquisition by the town of land for parks, open spaces, and specially wide streets, at a time when the price of the land has not been influenced by the development of the neighborhood.

LAND PURCHASE

In nearly every town visited, a determined activity in the purchase of land by the local authority was evident, and the power to purchase land as opportunity occurred did not entail any restriction as to the use the land was to be put to when acquired, so long as the common good was served. In Ulm, a city of about 50,000 inhabitants, with which is incorporated a very large amount of uncovered land, the local authority and public trusts controlled by it own about four-fifths of the total building land within the boundaries of the town, that is, about 910 out of 1,140 acres. Considerable profits are made in this land purchase policy. The great principle recognized by the German towns is the importance of preventing land speculation, in their opinion one of the greatest obstacles to the solution of the housing problem. German towns tax "unearned increment." When land is sold, the local authority takes a percentage of the in-

crease in value over the last price obtained. The bigger the rise in value the higher the percentage charged.

MUNICIPAL HOUSE BUILDING

Municipal house building as known in England was not to be found in any of the towns visited by the deputation. Houses have been built by several local authorities, and by the State Railway Management for the accommodation of their low paid employees. It is apparently preferred to provide low-rented houses rather than to raise the salaries and wages of those housed.

In certain towns the local authorities are building houses for working men to buy, but not to lease, and are adopting every means in their power to help the working men to purchase their own houses.

PUBLIC ENCOURAGEMENT TO PRIVATE ENTERPRISE

In most of the towns visited the policy of assisting private enterprise to provide working men's houses had been adopted with very satisfactory results. This had been done by guaranteeing the repayment of loans, the leasing of land on favorable terms, etc.

The arrangements for the inspection and improvement of existing houses were found to vary in different towns, but as far as could be ascertained the German powers in this direction are not greater than those in England. In several towns there are societies for the management of small house property, on lines similar to those on which Miss Octavia Hill has been so successful in London. It is interesting to note that this policy has recently been introduced into Birmingham.

FLATS VERSUS SINGLE HOUSES

In Germany there is a keen controversy concerning the relative advantages and disadvantages of flats and single houses, and in some of the towns visited the deputation was informed that they were endeavoring to educate the people to live in single houses. The flat system is everywhere very prevalent, but in the places visited the rents of tenement buildings were by no means cheaper than the single houses of Birmingham, in proportion to the accommodation obtained.

FLIES AND SCAVENGING

In a paper presented to the Royal Sanitary Institute, London, dealing with "The Waste of Infant Life," Dr. J. T. C. Nash, an English Medical Officer of Health, discusses a problem of growing concern to his colleagues and others interested in hygienic effort. In directing special attention to the excessive mortality from infantile diarrhoea—a disease which he characterizes as but a symptom, and due to the action of various germs—Dr. Nash has this to say in regard to the common fly:

"The fly plays a useful part as one of Nature's scavengers. Where flies abound I think it may be taken as a justifiable inference that decaying organic matter also abounds somewhere in the neighborhood. The only proper and effectual method of limiting the number of flies is to have proper, effectual and speedy methods and means of disposing of all forms of organic refuse. Midden-privies,

slaughter houses, cow sheds, stables, mews, and poultry-runs in towns are in my opinion incompatible with true sanitation. I hope the time is not far off when it will be illegal to have any such abomination within at least 100 yards of any dwelling houses."

It is an easy transition from this point to the necessity for effective street scavenging, on which he expresses the opinion that "the methods adopted in most towns at the present day are almost worse than useless. It is absolutely essential that all street cleaning should be effected while the organic debris is thoroughly wetted, either by rain or by a properly constructed water-cart which will effectually flush the street channeling, where all organic dust tends to accumulate. The dry sweeping of streets is an unsanitary procedure, and in my opinion responsible for many sore throats and other illness."

WORKMEN'S HOMES IN ENGLAND AND GERMANY

INDICATIONS are not lacking that a revulsion of feeling has set in against the so-called block dwellings which, but a few years ago, were hailed as affording a solution of the working class housing problem in the larger English cities. As compared with the "rookeries" which they were, in many instances, designed to supersede, these tenements are doubtless a great boon to those who



PORt SUNLIGHT: PRIMROSE HILL BEFORE DEMOLITION OF OLD HOUSES

occupy them; their structural features are hygienic in character; the sanitary appliances, whether used in common or serving individual families, are excellent in type, make and fitting, and the rents, where the municipality is the owner, generally within the compass of the class for which the buildings were intended. The reservation just made is material to the issue, because in important examples of nominally remunerative municipal blocks that result has only been attained by a process of "writing down" the land values so as to bring the gross cost, on the Housing Committee's books, within "reasonable" limits. This proceeding is facilitated, in many cases, by the fact that no money passes for the purchase of the land, which is transferred from other city accounts, such as that covering the work of an Improvement Committee, on terms settled between the respective committees concerned. Apart from the economic evil involved, mention may be made of the "log-rolling" which negotiations of this character are at least capable of encouraging. Passing over these points, however, there remains the more serious result—the Nemesis of the story—that the rate-aided* competition of such tenements forms an effective bar to private enterprise in the same line, thus tending to defeat the very object with which the municipality began its operations.

These considerations have naturally weighed with the increasing number of English people, whether philanthropists, social reformers, municipal idealists, or potential

investors in house property, associated with this subject, and there is yet to be added to them the objection—sentimental, it may be, but none the less an objection—that these dwellings do not satisfy the English longing for a home. It redounds to the credit of two large industrial concerns that they have led the way in showing what is possible in avoiding this particular stumbling block. Their efforts were described and discussed two winters ago at the Surveyors' Institution, London, and U. S. Consul E. L. Harris has recently supplemented an earlier report on German conditions by some references to this phase of the English problem.

The firm of Lever Brothers, well known as the proprietors of large soap works at Port Sunlight, near Liverpool, has set apart 140 acres for operatives' dwellings, 97 per cent. of which are built on the cottage plan. Each cottage has a garden as a foreground, serving also as a screen from the road. "The care of these gardens is not left to the people who occupy the dwellings, but they are looked after and kept in order by the management. . . . To every block of cottages there are what are known as allotment gardens. These gardens are intended for the tenants to raise vegetables or to fence in poultry. They are situated as near as possible to each cottage and afford to each tenant the means of healthy recreation." The reformation incidental to a programme of this character is typified by the contrasted views showing Primrose Hill in its original and present condition respectively, but the fly in the ointment, affecting the work as a representative instance of ameliorative effort, is the fact that the entire capital expended in buying the land, making roads, laying out parks, building houses, stores, schools, clubs, etc., amounting to \$1,750,000, is a gift by the firm of Lever Brothers, who "receive no interest or financial return whatsoever." The rent of \$1.25 per week "for each ordinary cottage" is probably absorbed by



PORt SUNLIGHT: NEW COTTAGES ON THE PRIMROSE HILL SITE

* English local income is derived from "rates," the word "taxes" applying to National revenue only.

maintenance charges and, possibly, some increment to a capital fund in the hands of trustees.

In the village of Bournville, near Birmingham, Mr. George Cadbury, the head of the well-known cocoa and chocolate making firm, has endowed the movement for good homes, not reserved entirely for the employees of Cadbury Brothers, with benefactions aggregating \$1,000,000, making up the entire village of 518 houses, with 458 acres of land, now occupied by over 2,000 people. This gift is abso-

The work done by the great German firm of Friedrich Krupp, in Essen, is widely known, the magnitude of the firm's operations facilitating the creation of separate villages, with special characteristics in each. Thus, the Altenhof colony, illustrated on this page, is devoted entirely to the use of invalid workmen, who are housed rent-free for life. In addition to 159 dwellings for invalids, there are twenty-four independent two-roomed apartments for widows, also a Protestant and a Catholic chapel, in which services are regularly held. Other colonies provide accommodation for bachelors, and special provision, differing from the apartments of one or two rooms set apart for "skilled workmen or specialists," is made for unmarried workmen and those whose families are at a distance. This includes board, the daily price paid by each person for bed and board being only twenty cents.

With a total of 4,274 houses, no fewer than 26,678 persons are actually housed by the Krupp firm, the 8,212 workmen representing about one-third of the total number employed in the Essen works. The value of the dwellings and appurtenances, including land, is estimated at \$3,875,000, and the *annual rents* vary from \$14-\$21 for two rooms in a "barrack" to \$64-\$95 for a five-roomed house or tenement.

The rate of interest received upon the invested capital is about 4 per cent., reduced by taxes, repairs, sinking fund and "management" to a net return of $2\frac{1}{2}$ per cent. per annum.



KRUPP ALTENHOF COLONY

lute, the trustees under the deed employing the net revenue in building houses and developing the estate. The roads, forty-two feet wide, are planted with trees, and an average of 600 square yards of garden space is allowed to each house. The illustration on page 275 shows the character of the dwellings and their relation to the gardens and front road.

GARBAGE REDUCTION IN CLEVELAND, OHIO

THE October number of the MUNICIPAL JOURNAL AND ENGINEER contained, on page 154, a brief account of the garbage reduction plant in Toledo, Ohio, visited by the writer and others during the August convention week in that city. The same writer recently had an opportunity of visiting works designed with a similar object in Cleveland, a point of special interest and significance being that the latter are owned and operated by the municipality, being indeed the only ones to which that description applies. Municipal garbage disposal is, of course, a common feature of English civic work, but reduction finds no place in that country, where the system of cremating the entire refuse, with more or less utilization of the products, has become an established factor of public sanitation.

The plant was taken over by the city on January 1, 1905, having previously been operated by a chemical manufacturing company in receipt of a yearly payment, from the city, of \$60,000 for collecting and treating the city wastes, not including night-soil. The condition of the plant and buildings, even after the repairs and additions made during the

first six months of the city's control, bears testimony to the existence of a transition stage, during which nothing beyond the bare necessities was provided for by the original operators, a circumstance which has an important bearing upon the financial results of the half-yearly period. Thus, of fourteen digestors taken over, five have been entirely renewed, at a cost of \$2,731, and there have been heavy expenses in completing and repairing equipment which, though disbursed in one half-year, will be of tangible benefit to the undertaking for a long time to come. The actual working cost to the city will be referred to later.

The process in use, though including digestors of the type installed in Toledo, varies from the Edson system in some important particulars. Power presses are used to free the digested material from a large part of its moisture before being passed on, with the result that this break of continuity between the digestors and the driers produces odors from which the Toledo plant is practically free. But additions to the plant, now in progress, contemplate the very desirable improvement involved in a change to the direct connection

method, and it may be confidently anticipated that the Toledo conditions in this respect will be reproduced in the Cleveland plant, with benefits to all concerned in its operation. The naphtha process, for extracting the fats by percolation and affinity, is in use, the naphtha used being condensed in separate receivers and saved for subsequent service, some amount of waste having, of course, to be met by new supplies.

The plant labors under some disadvantages as compared with that in Toledo. There, the plant is within easy distance of the city, and the garbage wagons deliver their collections direct to the plant, with the result that the receipts are distributed with reasonable uniformity throughout the day. In Cleveland, on the other hand, the plant is about nine miles from the city and the transport of the material is effected by rail, the bodies of the collection wagons being transferred to cars at a central station in the city itself. This leads to considerable pressure at intervals, especially on Monday mornings, and adds to the difficulty of dealing with the refuse by a plant otherwise ample for the purpose. This is chiefly felt on the upper floor to which the crude garbage is raised in order to be fed into the range of digestors, and the undue retention of the material is apt to lead to incipient fermentation which could otherwise be avoided.

In considering the financial results of the first half-year's operation under municipal auspices, regard must be paid to the items enumerated above and to the changes made in the working hours of the staff, with some increases in the wages paid. Three eight-hour shifts have been substituted for the company's system of working its men ten to twelve hours per day. There has also been an increase of fully 30 per cent. in the amount of garbage collected as compared with the corresponding period of last year. Notwithstanding these disadvantages, Mr. W. J. Springborn, President of the Board of Public Service, was able to present a report, in August last, the closing paragraph of which gives the results in concise form, as follows: "After assuming all of the above enumerated and other extraordinary expenditures and burdening this period with them after allowing for an annual depreciation of 10 per cent.; after charging against expenses the interest on the investment at 4 per cent. per annum, and excluding from the income all moneys received from taxes, the net cost for the first six months to the taxpayers has been \$30,418.22, for which the service rendered

the taxpayers has been 32.4 per cent. greater and more efficient than during the corresponding period of the last year under the contract, and for which \$30,000 was paid." Appended to the report is a detailed statement giving the results of an independent audit of the accounts by a firm of public accountants, which shows, among other evidences of conservative treatment, that a total of \$7,337 is included in the debits for items such as those to which reference has already been made, in addition to \$2,895 representing depreciation on the purchase cost of equipment at the rate of 10 per cent. per annum.

The average weight of garbage collected, monthly, during the half-year was 2,182 tons, and the principal item in the total receipts of \$30,014 was \$24,601 for sales of product.



HOLLY GROVE, BOURNVILLE

SPUR TRACKS IN SAN FRANCISCO

AN important matter affecting the commercial interests of San Francisco, and involving considerable litigation, is the maintenance of spur tracks. Three suits prohibiting their construction have recently been instituted, and the Board of Public Works has withheld the necessary building permits, pending a decision of the Courts. Meanwhile, ex-City Attorney Lane, one of the contending lawyers, has given an opinion, in substance as follows:

No question is raised as to the power of municipalities to grant privileges for spur pipes or spur wires, and with the

growth of cities as industrial centers the Courts have recognized that the spur track is also a modern commercial necessity. If the municipal authorities wish to check this blockading of the streets by trucks and merchandise, they may in San Francisco, as in other large cities, authorize a limited and restricted use of the streets by carriers which will more expeditiously get the goods off the streets. The Supervisors may wisely conclude that a truck is less of an obstruction to travel than a series of wagons, drays and trucks upon streets and sidewalks.

AN UNPROFITABLE WELSH STREET RAILWAY

A REPORT by U. S. Consul Williams, of Cardiff, dealing immediately with the operation of the municipal street railway system in that important city—the metropolis of Wales—discusses the question of British municipalization in general and indicates, in the results attained, much that deserves careful consideration and expert examination. "Public ownership of municipal utilities," Mr. Williams writes, is popular in many British towns, and recent enabling legislation has allowed the advocates of the system to make investments on a large scale. The schemes cover a multitude of utilities, some almost purely social, but the largest items have been spent on power plants and electric trams. The ratepayers do not find the last named profitable in all cases. For instance, the Cardiff Corporation Tramways, representing a capital expenditure of \$3,530,048, returned a net profit of only \$101.60 for the year ending March 31, 1905. This poor showing may be attributed to two causes, excessive costs and low income. In the matter of costs, a good showing was made so far as working expenses were concerned, for although there is a payment of time and a half for Sunday work, and double time for holidays, they amounted to only 11.88 cents per car mile."

Contrasting the relative working cost per car mile of ten large municipal street railway systems, of which nine are in England and one (Glasgow) in Scotland, Consul Williams shows this to vary between 10.36 and 14.50 cents, Glasgow being represented by the former figure, while Liverpool, to which we refer, elsewhere, as a remarkably prosperous undertaking, stands for the highest working cost. Cardiff, at 11.88 cents per car mile, is second only to Glasgow, so that the "excessive costs" referred to above must be sought elsewhere than in this item. Mr. Williams finds that these "were occasioned by the high loan charges, which amounted to 6.56 cents per car mile, or 33 per cent. of the total expenditure. This was due to the magnitude of the capital expenditure, and herein lies a lesson for the advocates of public ownership in America. It is useless to expect any municipality to pay when the undertaking is handicapped by its capital expenditure. The low income in 1904-5 may be attributed to several causes. First, of course, is the penny [2-cent] fare, which reduces the revenue to a minimum. The economic conditions prevailing in this country make penny fares imperative. The Englishman walks much more than the urban American, both from desire as well as necessity, and a higher fare would reduce the tramway revenue very much. The year's statistics demonstrate this fact, for, of the 23,372,579 passengers carried, 22,458,194 paid the penny or 2-cent fare, and of the others only 755,876 paid the 2-penny or 4-cent fare. In order to reduce working expenses, while securing all possible penny fares, tramway managers have found it necessary to divide their routes into penny stages. This recalls a misapprehension under which many Americans labor, for the penny fare on British trams is a stage and not a trip fare. A trip of five to fifteen miles, which can be made for five cents in

many American towns, is not possible here, for the longest penny ride is rarely two miles long, while many are much shorter. The longest in Cardiff is 3,930 yards and the shortest is 2,159 yards. These are representative figures.

"Perhaps the principal cause of the reduced income in 1904-5 was bad trade. This was an unexpected experience for the advocates of public ownership, and the lesson should be taken to heart by Americans. It appears that tramways are the first municipal utilities to feel the bad effects of hard times. Depression in trade has led to a reduction of wages in many industries, and the tramway receipts have registered these reductions like a barometer. The chairman of the British Electric Traction Company (Limited) is quoted as saying that the net profit of his company was about \$97,330 less than it was last year. At the same time they noticed that all companies of that sort had issued reports containing evidences of depression in trade."

Taking up the question of income per car mile in the same ten cities, Mr. Williams finds this to range between 18.00 and 21.88 cents, Cardiff being again next the lowest, with 18.06 cents. He states, however, that "in comparing the income per car mile with that of American systems four or five facts must be borne in mind. Many British towns do not operate their trams full time on Sunday, and the service in Cardiff does not begin until 2 p. m. Many double-deck cars are used, 100 of the 130 cars in Cardiff being of that type. British towns are more compactly built than American towns and long hauls into the suburbs do not prevail here. Overloading of cars is not permitted, and conductors show "Full" cards as soon as a car has taken on its quota of passengers. Stops are made only at certain points, and signaling elsewhere is useless."

Consul Williams does well in directing attention to these differences in conditions, which are apt to be too lightly passed over by advocates on each side of the American municipal problem. Recent official reports tend to show that, in adopting 2-cent fares for street car stages, English local bodies have allowed their enthusiasm to get the better of their judgment and it is more than probable that a readjustment in this respect will have to be resorted to if financial equilibrium is to be established. This is especially the case when, as he points out, the earning capacity of individual cars is sharply limited by the prohibition of overcrowding: It is not too much to assume that if American traffic managers were subjected to the same disability there would soon be a cry for an amended schedule, although it will, in any case, be difficult to disturb the established five-cent flat rate, except, perhaps, in an opposite direction. Meanwhile, it will be well to remember Mr. James Dalrymple's expressions of astonishment at the apparent forbearance and humility on the part of all classes of citizens in the great cities of America in permitting conditions with which he, as a passenger transportation expert, was first brought in contact during his memorable visit at the invitation of Mayor Dunne, of Chicago.

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NEW YORK, DECEMBER, 1905.

The Elections—And After

THE State and municipal elections decided last month, while they will be seized upon by the respective parties and sub-divisions as affording grounds for presumptions and conclusions disputed with equal vehemence by opposing factions, have demonstrated one thing beyond the possibility of refutation or even of doubt. A spontaneous revolt against party domination has been successful to a degree never before hoped for—much less attained—in a country so habituated to regard “straight voting” as a virtue that the splitting of votes had almost become a lost art. Even as it is, there are good grounds for the belief that some candidates—we have naught to do either with their party affiliations or their merits—suffered from the lapsed ability of their would-be supporters to express, at the polls, the desire that burned within them. But let that pass; the handwriting is graven on the wall so that he who runs may read.

There have been, and will be again, occasions when it has been felt necessary to apply such terms as "landslide" and "tidal wave" to the reverses which have overtaken one party or the other in the annual or biennial carnival carried on under the shadow of the polling booth. The present situation does not recall these occurrences except by way of contrast to what has happened in this year of grace, when both political parties and all the offshoots created by local idiosyncrasies have suffered alike. Surprises have been the order of the day, and to those who are able, as we claim to be, to survey the field from the vantage point of political impartiality, verging upon indifference, that one fact affords the most hopeful indication of the present temper of the American people. It is not necessary to do more than allude to the many causes, jointly operating, which have led to this wave of protest against boss rule. By one of those coincidences in which men of an earlier age would have

recognized the hand of destiny or the interposition of a Higher Power, a succession of object lessons and demonstrations has been laid bare under the scalpel of men, among whom Mr. Charles E. Hughes, "the arch inquisitor," will long rank, in the minds of American people, as a shining example of forensic acumen and almost phenomenal endurance. That the lesson has not been thrown away upon them is proof enough, if any were required, that the moral sense of Americans had not been dulled into torpor by those dominating forces which are sometimes cited to their discredit by domestic and foreign critics, many of whom are still rubbing their eyes over the amazing spectacle presented to their gaze.

"The country is safe," it may be said. But is it? Is there no danger that the present awakening, due to causes capable of arousing the most slumberous among us, will prove to have been merely the signal for a renewed period of lethargic and inglorious repose? We have a better opinion both of those with whom the decision rests and of the capacity to read the signs of the times now being displayed by men of the Cox type, whose chief anxiety seems to be to locate the tall timber and to find, in that umbrageous retreat, an obscurity from which they would have recoiled within one brief cycle of the moon. The opportunity has come to those who, in the past, have complained of its absence, and it rests with them, not merely to make good use of the time given them for putting their respective houses in order but to see to it that, so far as in them lies, there shall be no backsliding from the position fairly and squarely won at elections which will become doubly and trebly memorable as marking the inauguration of a better era.

Room for Discussion

MR. GEORGE B. PIKE'S "Commonwealth" article, dealing with the relative merits of contract and direct labor, reproduced in the present issue of THE MUNICIPAL JOURNAL AND ENGINEER, opens up a subject on which we imagine that much remains to be said. In contrasting the salient features of these two systems of carrying on constructional work, he is evidently fully aware of the serious drawbacks inherent to direct labor, especially as applied to municipal operations, without at the same time attaching to them the weight to which other observers consider them entitled. Thus, while duly noting, with a conviction which is evidently the result of experience, the fact that the poorer workmen, under municipal control, "are very liable to, and they often do, look upon city work as a pension job," he fails, in our opinion, to assess this disability in its true ratio of value when advocating, as he does later on, the adoption of a system from which contractors are excluded. He admits that, in the smaller cities, workmen of this kind "have more or less influence in a political way, and if discharged by the superintendent for shirking their work, or for any other cause," they do what seems best to themselves to nullify his position and authority. To meet this by saying that "a good superintendent will disregard this mode of action," is simply to beg the question, for it is only too certain that those who accept work in the spirit of these shirkers, especially under the political ægis more than hinted at by Mr. Pike, will know

how to carry the war to the point at which the "good superintendent" surely breaks down.

There may be advantages in the prosecution of work by direct labor, and we are, as a matter of fact, personally aware of many instances in which any other method would have resulted either in loss to the one side or injustice to the other. But it is a fallacy to suppose, as Mr. Pike apparently does, that "the contractor's profit" can necessarily be saved by its adoption, for to do so is to ignore the special experience which a skilled contractor and his staff are able to bring to bear upon their work. Apart from this, there is the sufficiently notorious fact that workmen, as a class, will not work for a public body as they, perhaps perforce, are accustomed to do when a contractor is the paymaster. As for the alleged difficulties in regard to securing the desired high standard of work, we believe that whatever of these have arisen, or are likely to arise, may be avoided by the more careful preparation of specifications in the first instance and by the employment of an adequate inspectorial force later on. In the same spirit, we think that the author of this article exposes himself to the charge of special pleading in magnifying the time and expense alleged to be involved in advertising for bids, filing bonds and other preliminaries to contract work.

Philadelphia

PEOPLE have become so accustomed to associate the City of Brotherly Love with revelations and scandals of startling magnitude that the investigating engineers' report on the city's filtration plant and boulevard system fell somewhat flat on ears rendered less than usually sensitive to external influences. Partly because its salient features have become common property since its appearance on October 30 and partly in agreement with the sentiments expressed by a contributor on another page, we refrain from entering at length into the voluminous document bearing the signatures of Mayor Cassius E. Gillette, U. S. Engineer Corps, and Mr. John D. MacLennan, M. Amer. Soc. C. E. Ordinary justice demands that criticism should lean to the side of a generous reticence when the reputation and liberty of a once trusted public official are at stake, and the approaching trial of the action against Mr. John W. Hill will afford ample scope for forming an opinion as to his culpability or freedom from complicity in regard to the conditions revealed.

That these are of vital import to the citizens will be gathered from the fact, stated in the report, that "\$18,760,000 in round numbers has been paid for work costing the contractors \$10,356,000," and that a further loss of \$467,000 will be sustained by the city if the contracts to which these figures apply are completed on the basis of the excessive unit figures. These data apply to waterworks alone, a further actual loss of \$273,217 being indicated on the boulevard work, with a prospective additional loss, under that head, of at least \$2,250,000 if the contracts were to be carried to the (bitter) end. The citizens have not even the consolation of feeling that they have got a good job for their money, for much of the work done by the favored gang of contractors is stated to be not first-class.

We gladly turn from this disheartening story of civic

mismanagement to the brighter side of it disclosed by Mayor Weaver's selection of Major Gillette to assume control of an undertaking of such momentous importance to a population daily exposed to deadly risks through the present supply of water. This is the first fruits of the judgment passed by the city electors in confirming Mayor Weaver in a position which many, of poorer fibre, would have been content to relinquish but in which every friend of good government trusts to see him going from strength to strength in the course he has mapped out for himself.

A Reasonable System

"THE Citizens' Bulletin (Cincinnati, November 18) refers to an official letter, received by a Cleveland water consumer, informing him that, owing to his moderate use of water in the year 1904, his advance deposit was in excess of the water bill by \$1.50, which amount would be refunded him on presentation of his October, 1905, receipt. Our contemporary, after recovering from the shock to nerves accustomed only to Cincinnati methods, proceeds to eulogize the business-like administration of the Cleveland department presided over by Professor Edward W. Bemis, and we almost detect the sigh which, we have no doubt, went with the reflection that such things are not done in Cincinnati.

The case cited shows what can be done in a city under proper management. Cleveland has more than 40,000 meters in service and is rapidly installing what are still required to make the meter system universal. The change from the earlier method has been effected with a wonderful freedom from friction and loss of revenue, and it is being gradually but effectively recognized that the meter system affords a reasonable basis of charging for water consumed without entailing any of the dread consequences once freely prophesied as fatal to its ultimate success.

The Ethics of the Junket

A DAILY contemporary utilizes the occasion of a municipal junket, to be carried out under somewhat usual conditions, to indulge in some reflections which it would not harm some other cities to lay to heart. Admitting that the object of the trip—the inspection of certain works—may be worthy and justifiable, it is urged, with considerable force and humor, that the city should not allow the expenses to be borne by a company interested in exploiting these particular works with an eye to their duplication in what we may call, for the moment, the junketting city. "As a general proposition, the usual aldermanic junket is as harmless as it is unnecessary. It would be small and captious to criticize too severely the city fathers who desire once in a while to exhibit their dignified selves upon the walks of other cities. Not one junket of this sort in a hundred ever amounts to anything more than a pleasant diversion, yet none begrudges the expense when incurred in moderation and only at long intervals." This, to be sure, reminds us dimly of the excuse put forward by the Scotch servant girl in respect of her baby—it was a very little one—and we are not sure that the same idea did not strike our colleague at that part of his writing, for he immediately adds that the proposed trip,

"at the expense of a concern that hopes to make a contract with the city, is wrong in principle. The hospitality will place a substantial obligation upon the city officials which will have its weight when they come to do business with this concern. Human nature is not proof against the blandishments and marked courtesies that will be extended to the aldermen. The trip will not make them any wiser than they were before, but it will give the . . . a powerful hold upon the city's purchasing agents."

Without going so far as to exclude the possibility of disinterested and unbiased action on the part of the aldermen and others when the time for judicial consideration arrives, we may at least endorse the wholesale principle laid down by an editor who is better able than we profess to be to judge from local and personal knowledge on that and other points. Recent happenings in this America of ours have awakened the public conscience to the actual existence of what, before, was merely suspected, and it will occasion no surprise if the immediate result is to quicken ungenerous impulses and to render it more than ever necessary that representatives and officials should, like Caesar's wife, be above suspicion.

Municipal Ownership

"THE Detroit Free Press," quoted in "Civic News" (Grand Rapids, November 4) comments as follows upon Mr. Marshall Field's utterances in regard to municipal ownership, to which we referred, editorially, on page 225 of our last issue. It will be remembered that Mr. Field alluded to municipal ownership as "a fad, which will drop out of the public mind like the silver question," and predicted that within five years Americans will not hear anything about it:

"We might concur in the conclusions of the eminent Chicago merchant if we could diagnose the municipal ownership movement as one of those spontaneous affairs which bespeak a passing discontent with trifles or if it were advanced as a remedy for an abuse of a trivial nature. It is the product of the same revulsion of feeling that has produced the insurance investigation, the demand for the regulation of railroad rates, the punishment of the beef trust, the government supervision of corporations, the elimination of graft, a revision of the tariff and pure politics.

"There is a settled conviction in the minds of the people that the time for a 'square deal' has come. It is an ingrained belief of the public that there should be inaugurated an era of fairness in commerce and industry. It is not considered a square deal when the right to run cars in a public street is made the medium of extortion, or the right to furnish gas or electricity to the people is expanded into a privilege to control legislatures and force the passage of laws that are hostile to the public welfare. There is a growing suspicion that the fathers of the republic gave no heed to the ultimate possibility that the corporations and the professional politicians would fuse and run the country for their own benefit and to their own advantage, or that the people would become the mere medium through which enthroned capital would achieve its selfish ends. Municipal ownership is a single manifestation of the demand for a higher moral standing. In specific cases it may be reducible to a decision

that it is best for a city to own its own street cars or its own gas plant or its own brick yard, but the achievements under it have been so few that it is impossible to say yet whether it is a positive demand for specific performance or a negative protest against existing conditions. It is the search for a remedy which will be of material aid in forcing a readjustment of affairs, causing an equitable system of charges and eliminating opportunities for corrupt practices. The movement may die out or pass, as Mr. Field says, but if it does it will be because the cause of it has been removed. It will be because the corporations and public service concerns have reformed their methods and evinced a disposition to treat their patrons, who are their creators, fairly, candidly and honestly. If public service corporations will give fair service for just rates, there will be less talk about municipal ownership. The corporations themselves are responsible for the agitation."

The Importance of Paving

THE MUNICIPAL JOURNAL AND ENGINEER welcomes, and takes pleasure in giving further publicity to, the following editorial from the Pueblo, Colo., "Star-Journal," the sentiments expressed being applicable to a far wider geographical range than the entire State which claims that paper's allegiance:

Street paving is to a city what a foundation is to a house.

Nothing adds so much to the aspect of solidity and permanency of a municipality as does the street with a solid, smooth and well kept surface.

There is no record of a city or a town ever having made a mistake by giving its streets a permanent and practical surface and no far-sighted owner of real estate has ever been known to regret a just and equitable expenditure for the same.

A city with fine buildings and mud or dust covered streets, is like a handsomely dressed girl wearing ragged shoes, and the impression made upon the stranger in the one case is identical with the impression in the other. The visitor from the country cannot be blamed for wearing a look of surprise when he sees rows of brick and stone buildings lining what appears to him to be nothing more than a country road; the visitor from other cities should not be criticized for holding the opinion that a city with dirt driveways in its business section is lacking in stability and commercial support.

It is a demonstrated fact that as soon as a city becomes sufficiently advanced to pave its streets, or any section of them, every foot of the abutting property advances in real value and the business activity is increased to a marked degree. The effect that street paving has had on cities all over the country, whether larger or smaller than Pueblo, has demonstrated the truthfulness of this statement to the entire satisfaction of all observers. Further evidence that this is true is apparent in this city at the present time, for no sooner has the announcement been made that the authorities and the property owners had agreed that a large portion of the business section of the city should be paved, than business took an upward turn and the stimulating effect on trade was quite perceptible.

It is a matter of congratulation to every resident of the

city that those in whose hands the destiny of the enterprise lies have come together on the idea that paving is the one thing that the city needs to bring it out of the state between a town and a city and place it upon the plane of real metropolitanism so long hoped for by every home-loving and patriotic citizen—a condition which will impress the tourist and the capitalist with the fact that Pueblo is all that it claims to be, that it is a substantial city, with a future unequalled by any other between the Missouri river and the Pacific coast—not simply a great railway and manufacturing center, but a city also of beauty and permanency, of handsome homes and progressive people.

Effective Sanitation

THE following extract from a lecture on Public Health, delivered to the Faculty of Medicine at the opening of the winter session at University College, London, by Professor Henry R. Kenwood, summarizes some of the results of English sanitation in the past, while affording eloquent testimony to the necessity for unceasing vigilance in the prosecution of sanitary measures, not merely in the collective sense generally understood, but as affecting the individual:

"While during the last thirty years the population of England and Wales has increased by 10,000,000, the gross mortality is less now than it was then; and public health policy has not only neutralized the increase in the death-rate, which, through increasing urbanization, would otherwise certainly have occurred, but it has secured a considerable balance on the right side. That the sanitary condition of this country has undergone a marked improvement since 1875 is incontrovertible, and the gains are well summarized in the Report of the Committee on Physical Deterioration. Testimony is almost unanimous as to the improving conditions under which the denizens of large towns are called upon to exist. Rookeries are being dispersed; enclosed yards opened out; cellar dwellings and back-to-back houses are disappearing. One-roomed, two-roomed, and three-roomed tenements, with more than two, four, and six occupants respectively, are diminishing. . . . Further, the water supply has been enormously improved both in purity and quantity; legislation has greatly extended the liabilities of owners and occupiers under the Public Health Acts and the Housing Acts, and under the said series of Acts wide powers have been placed in the hands of local authorities for cleansing unhealthy areas, closing insanitary houses, preventing overcrowding, abating nuisances, and enforcing generally a higher standard of sanitation. Machinery exists for the inspection and purification of cowsheds and dairies; pauperism has diminished; better and more complete accommodation is provided for the sick poor; the conditions of labor touching young persons and women in factories and workshops have been greatly ameliorated; and all the children of the State in workhouse schools, reformatories, and industrial institutions are started in life under far better auspices than formerly."

"But the fact that, whereas during the past fifty years the general death-rate has fallen some 26 per cent. and some millions of lives have been saved, the infant population has not shared in this reduction, even to the extent of 1 per cent.,

is a serious matter for reflection; and when it is considered in conjunction with the circumstance that the birth-rate has declined over 17 per cent. during the same period (a decline which during recent years has been at a greater rate than that of any other European country), it becomes a matter for grave national concern. If the fall in the birth-rate of our nation is to continue, as there is little doubt that it will do, it is essential for our national vitality to curtail the heavy expenditure of infant life."

Divergent Educational Ideals

THERE is some unpleasant, if stimulative, reading for English educationists in a report recently published by a delegation of Birmingham brassworkers after a visit to Berlin, their object being to discover "whether the brassworkers in that city have succeeded in attaining a more desirable physical and industrial life than that led by the brassworkers of Birmingham." So far as child life and education are concerned, the following extracts from the report do not appear to leave much room for doubt as to the answer. The first refers to a parish school in the Rigaer Strasse, providing for the needs of a poor quarter: "We saw no case of underfed, poorly clad, or untidy children, either in the streets or in the school. The children of needy parents receive shoes and clothes from the municipal poor guardians and societies. They must come clean and well dressed. There are thirty-six official school doctors in Berlin, each having a group of about seven schools to attend to. Every new scholar is examined by them, and doubtful children are thoroughly examined in the presence of their parents. If needful, they are kept under medical supervision, and special seats are provided where defective vision or hearing render it advisable. Spectacles or instruments are provided. The director has funds supplied with which to help needy children with food; but the sum required was practically nothing, for it only amounted to £4 [\$20.00] per annum among the 2,000. In the basements were extensive bathing accommodations, principally warm shower baths. Each of the 2,000 children received a shower bath weekly."

The report proceeds to contrast this example with a representative working class school, thirty years old, in Birmingham: "The children were mostly dirty and tattered; a large number wore very bad boots, not cleaned; and some with soles so dilapidated that the toes showed through. The physique of the children was puny. Outside the school there were evidences that the children of the neighborhood were undisciplined and out of control. In comparison with the Berlin school, everything was very dirty and untidy."

It must be said, however, that things educational in England are still to a large extent in the melting-pot, where they were thrown by the legislation—beneficial in its ultimate results—which transferred the schools from special bodies, elected *ad hoc*, to the general governing bodies of the country. The point which strikes those who are accustomed to American ideals on this subject is, on the one hand, the unwillingness of the English to devote sufficient funds to educational necessities and, on the other, the fixed belief on their part that money is being lavished in that connection.

LETTERS TO THE EDITOR

Garbage Disposal

The Editor, MUNICIPAL JOURNAL AND ENGINEER,

SIR: Papers read before societies or associations devoted to municipal sanitary progress are naturally presumed to be the work of men who write from an unprejudiced standpoint, contributing from their store of knowledge and experience with the sincere desire to convey information of real service to the body concerned, and through it to the public. When published, these papers become fair subjects for comment, and if inaccurate in statement of unsound in doctrine, their authors invite and may expect criticism.

Knowing the MUNICIPAL JOURNAL AND ENGINEER as an advocate of candid expression of opinion on municipal questions and an ardent champion of progress, I beg to be allowed to place before your readers certain inaccuracies of statement and misconceptions of facts which appear in a paper read before the American Society of Municipal Improvements, at its Montreal Convention, in September, by Mr. Howard G. Bayles of this city, upon "Incineration of Municipal Waste." The paper referred to might be said to have been prepared as an *ex parte* argument in favor of an incinerator of a particular make—struggling against its lack of scientific principle in construction, and handicapped by some unfortunate installations. The statement that "to discuss reduction at any length would be to waste your time," betrays either want of knowledge or an inclination to evade fair consideration of reduction methods in use in at least fifteen of our large cities, including plants annually handling many thousand tons of garbage and in which a large amount of capital is invested. The single example cited, that of Columbus, Ohio, would appear to have been chosen as showing losses due to faulty construction and to unskillful management, the statement being made that "reduction has everywhere proved an expensive nuisance." This is not true in the case of New York City, Brooklyn, Philadelphia, Baltimore, Washington, Detroit, Cincinnati, Pittsburg, Cleveland, Toledo and several smaller cities. The evidence of well-informed engineers is directly to the contrary, and to the effect that these plants, while expensive to build and operate, still do this work in an unobjectionable way.

The writer of the paper distinguishes between "cremation," as used for the destruction of garbage, and "incineration" as applied to mixed waste, thereby trying to establish in favor of an incinerator a claim that does not exist. Any cremating furnace will burn mixed waste as readily as any so-called "incinerator." Milwaukee is cited as an example of a brick crematory, very expensive and offensive in operation. This furnace, I may say, was an attempt to improve on the original form of the Engle Cremator. It was unfortunately located, and largely for that reason is expensive to conduct; but the sweeping assertion that it is the cause of numerous complaints is not borne out by the testimony of the Department in charge.

Muncie, Ind., comes strongly to the front in the paper as possessing an incinerator now destroying waste in an efficient and economical way. This city has had, since 1892, a Smith-Siemens furnace, using natural gas as

fuel until this became too costly and the furnace too small to keep pace with the waste production. It was replaced in July of this year at a cost of \$18,000, by an "incinerator," constructed to burn daily forty tons of mixed waste, 10 per cent. of which was to be night-soil, at a cost of fifty cents per ton for fuel and labor. On its completion, on July 11, the trial test made showed that the furnace would destroy fourteen tons in twelve hours, at a cost of \$1 per ton. In a second trial, on July 16, forty hours were required to consume forty tons of waste, at about the same cost as before, and the city refused to accept the incinerator. The interested company, claiming that the waste material furnished for the trial was not in accordance with the contract, hired men and teams, made its own collection, and proceeded to burn this in its own way. This is the trial referred to when the author of the paper says he was honored by being asked to tally the results. He reports destroying twenty-eight tons of garbage, 9½ tons of combustible waste and four tons of night-soil. This may have been done at the figure named, but a trial of this sort, with selected waste, burned by expert help, is not the same as one extending over a ten days' period of actual work, under normal conditions. The true test is the performance of the work by the town employees during a period long enough to eliminate artificial conditions. Following up these proceedings, the company claimed payment on its own report of its own trial, which was refused by the city. The last reported action is the proposition of the company's attorney, as given in his statement to the Board of Public Works, October 11, 1905: "As you know, the Board has gone on record as saying it was not pleased with the furnace in its present condition. Although the company feels that the plant has met all requirements, rather than enter into litigation it has decided to alter the plant at its own expense, at the suggestion of the Board. The one great fault, as seen by the Board, was that the fire was extinguished by wet garbage falling upon it. In order to remedy this fault the company has agreed to install two auxiliary furnaces, one on either side of the present plant, for the incineration of swill, slops, and very wet materials. Of course, no money is expected by the company until tests have been made and everything found satisfactory."

In commenting upon other forms of cremating furnaces at Staten Island, Atlantic City, Trenton and Yonkers, the writer of the paper condemns what he calls "brick furnaces," and especially fire-brick grates, also grates of iron or steel, used for supporting garbage during combustion. He cites one crematory, in particular, as embodying three features of faulty principle and construction—oblivious of the fact that this is a steel covered furnace, successfully operating in various forms for twelve years and now having some fifty installations in active and successful use. He puts aside as of no value the fact that brick furnaces, now in use and built twelve and fourteen years ago, are successfully doing their work. This, too, although he might have obtained accurate data from Norfolk, Va., where a brick furnace, built in 1892, in ten years burned 60,000 tons of garbage and refuse at a cost of 50 cents a ton for fuel, labor and repairs, a record which can be verified by con-

sulting the official reports. He might also have found other cremators, all of brick construction, with almost an equal period of service, still in active use in seven cities.

The chief purpose of the paper appears to have been to exploit the work of an "incinerator" which is set up as the ideal and standard form of cremating furnace for this country. This incinerator had its origin in Westmount, a ward of Montreal, Canada, where the first one was in operation late in 1899. It was operated for six months, burning from eighteen to twenty tons of waste daily, and was then abandoned for reasons made apparent by the following: The Medical Health officer of Westmount reported: "that the complaints of nuisance were justified, and the odors and smell were disgusting to the senses and a detriment to the health and comfort of the citizens." The Chief Constable and Sanitary Inspector reported: "that within a few weeks after the active operation of the plant, numerous and persistent complaints were made by citizens living within one mile."

The Secretary Treasurer of the Corporation said: "The smell from the smoke was very disagreeable. The incinerator while operated at present is a menace to the health of the residents and a detriment to the value of property in the vicinity."

The Town Engineer, in an official report, stated that "the two main faults are, that it does not reduce to ashes all combustible solids, and all noxious gases are not destroyed. . . . The primary purpose of an incinerator is to reduce all combustibles to ashes and destroy all obnoxious gases. The walls of this furnace are water jackets; it is in fact a steam boiler nearly of locomotive type, therefore the surfaces surrounding the fire, except the grate, cannot get hotter than the water in the boiler."

In 1899, the year of its construction, a protest, signed by a large number of citizens and property owners, was filed; and early in 1900, on the expiration of the six months' contract, the corporation declined to renew it. The incinerator was not used after this except for special demonstrations for the benefit of parties interested. It is now abandoned and partially demolished, and the town is now building a modern destructor of the English type.

About the same time, 1900, the city of Minneapolis paid \$2,000 for the plans and rights to construct this same incinerator, which was located on the work-house farm at the extreme northern boundary of the city, some four to five miles from the center of population. This site was selected only after vigorous protests from property holders in other sections where it was at first proposed to be placed. The operation of this incinerator, which has been carried on by the city of Minneapolis under the direction of the company organized there for its exploitation, has been claimed to be uniformly successful. It has been run at a low cost for fuel, which in this case is "edgings" or refuse from lumber yards, costing about \$1.25 per cord. In September of this year a fire occurred at the plant, the repairs being reported to have cost \$2,500. Its sanitary operation has been seriously questioned, and at the hearing in New York, in June, 1902, it was shown by competent evidence that the stack discharged an almost continuous stream of

heavy smoke, which began to fall and reach the ground at a distance of from 400 to 500 feet and spread for long distances. This was often accompanied by a cloud of bits of partly consumed, light refuse. Since there are few or almost no residents in the vicinity, there are probably few complaints, except from the adjoining work-house tenants, who naturally have no standing. I maintain that no accurate knowledge of the performance of this incinerator can be had until it has been operated by disinterested parties, under normal conditions.

But the incinerator built in New York City stands at the head of the list for inefficiency and expensive final disposition of municipal waste by this system. The incinerator erected in the Borough of the Bronx in 1902 was contracted for to destroy "100 tons of garbage and 200 yards of light refuse per day, in a manner not prejudicial to public health;" and the process was to be "not only not noisome in its operation, but also effective as to final results."

The contract was accepted in September, 1902, at \$16,000 per year for five years, and after several false starts, caused by the opposition of local property owners to proposed sites, the plant was put into operation in June, 1903. From the first it was evident that the capacity as then built was too small, and that the incinerator was incompetent for the work. The company was given time to make needed changes. Meanwhile the complaints of nuisance filed by property holders were passed upon by the Health authorities and due notice given the company to abate. The company was placed on its defense in the courts, and at full and exhaustive hearings the charges of the complainants were established and the matter was referred to the city authorities.

The Commissioner of Street Cleaning of New York reported to the Board of Estimate September 2, 1903, that "the company had failed, after ample time had been allowed for it to perform the work satisfactorily of the final disposition of garbage and rubbish in the Borough of the Bronx in accordance with the terms and conditions of said contract, and that there was no prospect of its being able to do so in a reasonable time. I deemed it advisable to terminate said contract to take effect July 1, 1903." Upon this report the Board of Estimate approved the action of the Commissioner as of the same date, September 2, 1903, and the incinerator was never operated after July 1, 1903. It stands as an expensive monument to an ill-advised attempt to make it do work utterly beyond its power.

Passing over the installation of small incinerators of this type at Tampa, Fla.—where a plant was officially reported as operating at a cost of \$1 per ton for expense of disposal—and at Johnstown, Pa., where a small plant was built for and operated by private parties for their own benefit, the last and most ambitious incinerator was built at Atlanta, Ga., in 1904. The city specifications called for a plant with a capacity of 200 tons daily, to be destroyed at a location nearly in the center of the city, at a cost not to exceed 45 cents per ton. The price paid by the city was \$31,000, and the plant was to be ready in four months. Nearly a year afterward the incinerator went into service and during the winter months was said to do its work. But when the real

test came, in the summer of 1905, there was evidence that it could not meet the stipulations in point of capacity and cost of operating. The Chief of the Sanitary Department reported, July 2, that "since the summer garbage, consisting of melons, decayed fruit and other wet garbage, had begun to accumulate, he had been forced to have many loads hauled out to the dumping grounds because the crematory could not burn it, the fires being smothered out when it was dumped in." He was instructed to use additional wood, at a cost of \$10 to \$25 per day, and to report later what the additional cost would be.

In August complaints were made that disagreeable odors from the incinerator were noticeable at the Century Building, about three blocks away. The President of the Board of Health said "that at times when the garbage was heavy, it was impossible to prevent all odors from the plant, but that everything was being done to eliminate them." Here, again, no definite information as to capacity, cost and nuisance can be had unless by the examination of a competent and disinterested authority after a prolonged trial under the usual working conditions.

Spokane, Wash., has been cited as an example of low cost of operation of this incinerator, but the official reports for the six months July, 1904, to January, 1905, are as follows:

Total tons destroyed.....	2,378
Total expense, fuel and labor.....	\$1,877.40
Total received from outside parties.....	206.80

Expense of operation 70 cents per ton

About one-half the fuel used was sawdust and wood edgings, obtained at a very low cost per cord. Subsequent reports are to the effect that the cost had increased to 82 cents per ton.

The attempted comparison, in the paper, of the record of this Atlanta incinerator with the construction, cost of operating, steam development and other results attained by English destructors is unworthy of serious comment. Similarly, the statements respecting the disposal of combustible waste at Boston, New York, etc., show a strange disregard of the facts in regard to an important phase of municipal waste disposal work.

The construction of this incinerator, as described in the paper, shows it to include three distinguishing and now obsolete features of American furnaces. The water-jacket was originally devised for this work by Brown of Boston, about 1893, in his experimental furnace, and afterwards built at Wilmington, N. C., only to be given up because of the loss of heat due to the water circulation. The Δ -shaped grates were a part of the first furnace built on Governor's Island by Lieut. H. J. Reilly in 1885—the first cremating furnace for garbage ever built in this country. His furnace was finally abandoned by the Government, the last example being built at Fort Totten in 1895.

The hollow grates with water circulations, used for sustaining garbage, were first employed at Jacksonville, Savannah and Richmond, and were given up and replaced by firebrick because of the enormous loss of heat and slow combustion of waste in contact with the water bars. This principle was also adopted by furnace constructors at New-

port News, in 1899, and utterly failed, the city refusing to take over the crematory because of its failure to burn the garbage in the water grates.

It is well known that to preserve iron grates from burning they can be made hollow and filled with water, but the fact that no higher temperature than that required to produce steam can be applied to material burned in contact with them has been ignored in the case of this incinerator. When a water jacket which protects the exterior walls is added to the water grates, the loss of heat is multiplied ten-fold.

This low temperature, with slow combustion and imperfect apparatus for the destruction of gases, is the radical difficulty developed by this imperfect procedure and the experience of all the world in this work for many years past is directly counter to it.

The steam power claimed for this invention is practically non-existent, as the low temperature of the furnace and the form of water-jacket construction, combined with water grates, are not consistent with a pressure of any reasonable amount.

A writer who puts forth statements based largely on conjecture and deals in such general condemnation seemingly aims to prejudice his readers against all methods and systems except that taken under his wing for the time being. For myself, I may be allowed to doubt whether this new "incinerator" "marks the beginning of a new era in municipal final disposition." Certainly its record up to this time does not justify any such claim.

Yours very truly,
W. F. MORSE.

25 Broad street, New York City, Oct. 20, 1905.

A proof of the foregoing letter was submitted to Mr. Bayles, from whom the following reply has been received:

The Editor MUNICIPAL JOURNAL AND ENGINEER,

Sir,—The extensive remarks of Col. William F. Morse on my paper discussing the Incineration and Cremation of Municipal Waste are highly interesting, and I thank you for giving me an opportunity to reply to his somewhat sweeping denunciation of my accuracy, judgment and sincerity. It might be pertinent, with reference to his opening paragraph, to ask, with all due deference to Col. Morse's reverend age and dignified attainments, whether he has ever written on waste disposal from any motive other than that of one who had one type or another of crematory or incinerator (he may choose his term) to exploit.

The first remark to which he takes particular exception is that "to discuss reduction at any length would be to waste your time." The title of the paper limited its scope, and the clause meant simply that reduction was both so alien to the subject under immediate discussion and so familiar to the audience that to describe it at length would be a work of supererogation. It will give me pleasure at some future time to take this subject up fully and give it all the consideration it deserves. Col. Morse objects to my generalization that "reduction has everywhere proved an expensive nuisance." He admits that it is expensive, however, and I cannot imagine that any fair-minded engineer who had ever visited a reduction plant would hesitate to class it as a nui-

sance of so pronounced a character that only a remote location is possible.

The distinction between cremation and incineration was drawn solely in order to make myself more readily understood; it certainly was not prompted by any such ulterior motives as Col. Morse attributes to it.

With relation to Muncie, Indiana, Col. Morse is so fully informed that it is difficult to believe that he did not know more than he has said. The final test, to which he alludes as one made with selected waste burned by expert help, was the first made in accordance with the terms of the contract. My report on it was made in collaboration with, and received the full indorsement of, Mr. C. C. Brown, M. Amer. Soc. C. E., President of the American Society of Municipal Improvements, and Editor of the "Municipal Engineer." The Muncie incinerator was ordered in good faith, and presumably under the conviction that it was the best type obtainable, by the City Council. Before its completion, a new State law vested the power to make such public improvements in a Board of Works. This body, when appointed, proved to be of opposite political convictions from the City Council and made a political issue of the matter. I have excellent reason to believe that it decided in advance to refuse acceptance of the incinerator. It is at least certain that the first two tests were made, not with the mixed refuse called for by the contract, but with saturated swill, liquid night soil, and nothing else. The waste burned in the final test, at which I was present, was of extremely low grade as to combustible quality, and the help wa's not skilled.

My condemnation of brick furnaces, and my particularization of one type embodying three faults of design, were perfectly sincere. While I regret drawing upon myself the condemnation of so eminent an authority as Col. Morse, I cannot see my way clear at present to revising my conclusions. Col. Morse is in a better position than I am to know how many furnaces have proved more or less successful and how many have been abandoned as too costly to operate and maintain. Certainly, in spite of his praise, they have not all proven unqualified successes.

My commendation of the Atlanta furnace and others of the same type was intended to be well within what the facts warranted. Col. Morse's long-standing and well-recognized antipathy to the same make of furnace, as evidenced by "The History of a Failure," and other writings to which he has given the widest possible publicity, bears rather the hall-mark of bitter competition than of outraged engineering dignity. Certainly he has better reason for damning this furnace than I for commanding it.

The implication that the Minneapolis Board of Health is an interested party, operating the plant under artificial conditions, is a public insult to the probity of Dr. P. M. Hall, the Health Officer, which, to the best of my knowledge, is wholly unwarranted and unworthy a place in a scientific discussion.

I have taken the trouble to inform myself from original sources as to the history of the Bronx plant. In the first place, the plant embodied certain features of design suggested by the then manager of the contracting company,

and insisted upon in opposition to the protests of its engineer. I have also excellent reason to believe that popular prejudice before the trial so acted through political channels that, when the test was made, impossible conditions were imposed and the failure was predetermined. The mistake in design also contributed to the failure. If Col. Morse cares to deny these statements, I shall not take the trouble to reaffirm them. One more misconception, implied rather than stated, is that the city was a heavy loser by the failure. This was not the case and not a cent of public money was involved.

As to the rest of Col. Morse's invective, I can only say that the figures I gave were public property, and gleaned from original sources. Anyone who is sufficiently interested can easily verify them. My conclusions represent my personal opinions. I did not at any time think that Col. Morse held like views. It is enough for me that a number of equally eminent engineers have been cordial in their indorsement.

Very respectfully,

HOWARD G. BAYLES, Met. Eng.

37 West 34th street, New York City, Nov. 13, 1905.

QUERIES AND REPLIES

INQUIRIES of general interest, with such parts of our mailed replies as contain data possibly of service to others, are reproduced in this column, which is also open to those desiring to obtain information from readers.

Civic Improvement

A mayor writes as follows:

"I am having quite a lot of grading done on streets and sidewalks, building curbs and retaining walls to property, terracing lawns, etc. I want a book or magazine showing cuts and pictures of steps and walls, etc., building brick, pillars and different designs. I wish you would get me something of what I need. I am trying to encourage my people to do some permanent work, and, while doing it, I like to use some architectural ideas and beautify their homes and sidewalks. Any information given will be duly appreciated."

To which we replied:

"Charles Mulford Robinson's 'Modern Civic Art' is the only work covering the ground of your inquiry. While it may not refer specifically to the points you want to bring out, we believe you will find it of material assistance to you along the line you are working on. It is well thought of and should be in every municipal library in the country."

Water Filtration

Another mayor stated that "Just like many other cities we have the pure water problem to solve. I would kindly ask of you to send me the names of the cities using filtration plants, the kind and also source of supply. We intend to hold a citizens' meeting, and if possible would like this information."

For his information it was explained that "The list of cities using filtration plants is so extensive that it would be quite impracticable to copy it in detail for you. For instance, according to the Municipal Year Book of 1902, there were

243 cities and towns using various methods of filtration. Of these, 141 were mechanical filters and 21 slow sand filters; 53 had adopted filter galleries, etc.

Dust Preventives

A correspondent asks as to the nature of a new dust-laying material known as Akonia, which is described as possessing excellent qualities in this respect. We are not aware of its composition, but it is one of a number of materials with which experiments have been made in Great Britain during the last few years. It is claimed that it does not discolor the road or make the surface slippery, and that it will keep down dust for three or four weeks. An English local surveyor, who experimented with it, found that an application in the proportion of 280 pounds to 100 gallons of water was effectual if repeated at intervals with a solution of half that strength. He formed the opinion that an actual saving over the cost of street watering might be effected by its use, while the results were better than watering could produce.

Municipal Asphalt Plants

To an assistant city engineer, desiring "information as to the cities in the United States having municipal asphalt plants, with any data in regard to their operation," we wrote:

"Presuming that you have in mind the larger sized type of plant, such as is required for resurfacing, we may mention Winnipeg, Detroit, Montreal, Omaha and Pittsburgh as the only cities of which we are aware, with New Orleans proposing to build one. Quite a few places have the smaller hand outfits, but these are used for small repairs. Newark, N. J., uses one of these with great success."

Convention Dates

December

AMERICAN ECONOMIC ASSOCIATION, Baltimore, Md., December 26-30.—Frank A. Fetter, Morril Hall, Ithaca, N. Y.

January

NEW ENGLAND WATER WORKS ASSOCIATION, Annual Meeting, January 10.—Willard Kent, Secretary, Tremont Temple, Boston, Mass.

February

NATIONAL BRICK MANUFACTURERS' ASSOCIATION and the AMERICAN CERAMIC SOCIETY, Philadelphia, Pa., February 5-17.—Theo. A. Randall, Secretary, Indianapolis, Ind.

March

ARRANGEMENTS are being made for holding the next annual convention of the NEW YORK AND CHICAGO ROAD ASSOCIATION in Hornellsville, N. Y., in March. Details will be announced later.

Personalities

MR. R. J. TRAMMELL has been appointed City Engineer of Greenville, S. C.

COL. GEORGE M. FRENCH has been elected City Engineer of Hot Springs, W. Va.

MR. CHARLES A. BOGARDUS has been elected Superintendent of the Water Works of Chicopee, Mass.

MR. SAMUEL SUTCLIFFE, Chief of the Bureau of Street Cleaning of Philadelphia, Pa., has resigned.

ALLEN ROBERT GILCHRIST will succeed the late D. W. Ford as City Engineer of Montgomery, Ala.

MR. J. H. WINGATE, City Engineer of Roanoke, Va., for ten years, has resigned, as noted in an editorial in this issue.

CHAS. A. MILLER, City Clerk of Harrisburg, Pa., has been re-elected by the City Council for a term of four years.

MR. J. C. HERRING, senior member of the Herring-Hertel Engineering and Construction Company, of Jefferson City, has been appointed City Engineer of Fulton, Mo.

MR. WALTER S. WOODS, City Engineer of La Crosse, Wis., has been appointed a member of the Executive Committee of the Upper Mississippi River Improvement Association.

MR. ROSCOE N. CLARK has been promoted to the position of Assistant City Engineer of Hartford, Conn., succeeding Mr. H. R. Buck, who resigned to become Chief Engineer of the Connecticut Boundary Commission.

MR. CALVIN WHEELER HENDRICK, whose work in connection with the crossing of sewers by the tunnel of the Interborough Rapid Transit Company, New York, stamps him as possessing exceptional ability in this line of work, has been unanimously elected Chief Construction Engineer of the new sewerage system to be installed at Baltimore, Md.

DR. T. VICTOR KEENE, whose work in connection with the Indianapolis sanitary laboratory was discussed in an article in the November issue of this JOURNAL, has been selected by the Indiana State Board of Health as Pathological Superintendent of the new State Laboratory, which has been equipped under his direction. This appointment will not interfere with Dr. Keene's civic functions until the close of his present year of office.

MR. SAMUEL B. WILLIAMS, City Comptroller, in his annual report for 1904, gives a complete review of the financial conditions affecting the city of Rochester, N. Y. A new feature in the tabular matter is a General Balance Sheet, the data from which the figures are derived being published in the form of exhibits. Among other things revealed, the satisfactory condition of the city's finances stands out prominently. Mr. Williams comments on this by saying that "the city of Rochester should feel quite contented, as its entire bonded indebtedness could be paid off on short notice by the sale of its water-works system."

MR. JOHN CASSAN WAIT, who delivered this year's Founder's Day address at the Thomas S. Clarkson Memorial School of Technology, Potsdam, N. Y., on November 30, has had an unusually diversified experience in engineering work. He graduated from the Civil Engineering Department of Cornell University in 1882, and from 1887 to 1894 was instructor and assistant professor of engineering at Harvard University. Attendance at the Harvard Law School during that period enabled him to take the degree of LL.B. and he possesses the coveted Cornell degree of Master of Civil Engineering. He was for some time technical editor of the "Railroad Gazette" and is well known as the author of a standard work on "Engineering and Architectural Jurisprudence."

A Personal Discouragement

CONDITIONS which, as we are glad to believe, are exceptional in American civic life are revealed by the following extract from the letter of resignation recently submitted by Mr. J. H. Wingate, City Engineer of Roanoke, Va. Even from this optimistic point of view, it is disappointing to receive such an indication that the old leaven of personal self-sufficiency which is prone to actuate a certain class of local legislators is still capable of mischief. We have no knowledge of the circumstances beyond the terms of the letter, but it is clear that a disposition to expect impossibilities has been displayed and that inadequate support has been given to a conscientious official in a department calling for all the backing that councillors, as individuals or as a body, can accord. The extract follows: "If it is the policy of your bodies to permit contractors to make their own specifications and perform the work to their own liking, the services of a city engineer are unnecessary, and the expense of maintaining the office is a waste of money, so far as the contract is concerned. I have never, and will never, submit to the work being done under my administration without proper inspection; this is due to myself who am the responsible head of the department, and also to the tax-payers who pay the cost. Is it possible for you to find a man who can do all these things without increasing the cost of running the department? I cannot, and therefore tender my resignation, to take effect as soon as my successor qualifies, my office is checked and any investigation you desire to be made, is made."

Fire and Police Personals

GRANT HEED has been elected Chief of the Fire Department of Washington, Pa.

G. D. WILSON has been elected Chief of the Fire Department of Somerville, N. J.

GEORGE EMEUR has been elected Chief of the Fire Department of Newton, L. I., N. Y.

F. TUBBS has been appointed Chief of the Fire Department of Rock Island, Ill.

D. M. PARKS is Chief of the newly re-organized Fire Department of Pittsfield, Me.

E. V. SAMMIS has been elected Chief of the Fire Department of Huntington, L. I., N. Y.

J. P. NOLAN has been appointed Chief of the Fire Department of South St. Paul, Minn.

WILLIAM RAILL has been elected Chief of the Fire Department of Breslau, L. I., for the fifth time.

W. P. MADISON has been elected Chief of the newly organized Fire Department of Grove City, Minn.

CHARLES L. KELLEY, Chief of the Fire Department of Babylon, L. I., who resigned, has been unanimously re-elected.

ASSISTANT CHIEF BUYSSE has been appointed to succeed Amos Willard, resigned, as Chief of the Fire Department of Mishawkee, Pa.

JAMES S. BAR, for nearly twenty years Chief of the Fire Department of Kenosha, Wis., has resigned, and is succeeded by Henry Iverman.

ADELBERT COFEMAN, Chief of the Fire Department of Fond du Lac, Wis., has resigned, and is succeeded by C. O. Cleveland, former Chief.

HARRY A. MCQUADE, Chief of the Fire Department of Chattanooga, Tenn., has resigned and is succeeded by William Toomey, formerly Assistant Chief.

A Municipal League Meeting

A MEETING of the Municipal League of Indiana, held in Indianapolis on November 15 and 16, attracted a large number of city officials. Marion, Ind., was selected as the place for the 1906 meeting, to be held June 4-7. The officers elected for the ensuing year are: J. Fred France, Mayor of Huntington, President; B. R. Russell, former Mayor of Crawfordsville, First Vice-president; George A. Carr, Mayor of Greenfield, Second Vice-president; John F. Taggart, City Clerk of Richmond, Secretary; L. W. Mellette, former City Attorney of Elwood, Treasurer. With the exception of the President, all served last year and were re-elected.

In the course of a discussion on municipal ownership, Finley P. Mount, City Attorney of Crawfordsville, favored a franchise to a private corporation, instead of municipal ownership, provided that the franchise is carefully drawn and properly safeguarded. He divided franchises into four classes—water, light, telephones, and street and interurban railroads. The experience of towns of which he had knowledge along the line of municipal ownership in the last five years would, he said, justify two reports, one for and one against municipal ownership, prompted either by political bias or civic pride. The impossibility of eliminating the political element under municipal ownership made him dubious as to its ultimate success.

Some fault was found, by various speakers, with the absence of a provision, in Indiana's new municipal code, to repeal the metropolitan police law which places the police departments, in all but five of the largest municipalities, under the control of boards appointed by the Governor of the State. It is alleged that the result has been to transfer the political influence exerted from the cities to the State and that Governors have been known to use the local metropolitan police for their own political advancement.

Mr. R. O. James, of Vincennes, was named as the head of a committee of city officials to work out a scheme whereby State and local authorities, railroad police and other agencies can coöperate in controlling the tramp nuisance.

THE CITY OF HUNTINGTON, IND., with a population of 12,000, enjoys the reputation of having well cleaned streets. Mr. C. Stahl, Street Commissioner, states that he has under his jurisdiction 120,000 square yards of brick paving and 16,000 square yards of Warren's bituminous macadam, besides two miles each of ordinary macadam and graveled streets, the former with brick channels. He divides the work among eight sweepers, making each responsible for his own section, and the sweepers' pay-roll amounts to \$346 per month. A point is made of keeping down the growth of grass in the channels, the men being carefully instructed in this respect.

THE SEWERAGE OF NORFOLK, VA.

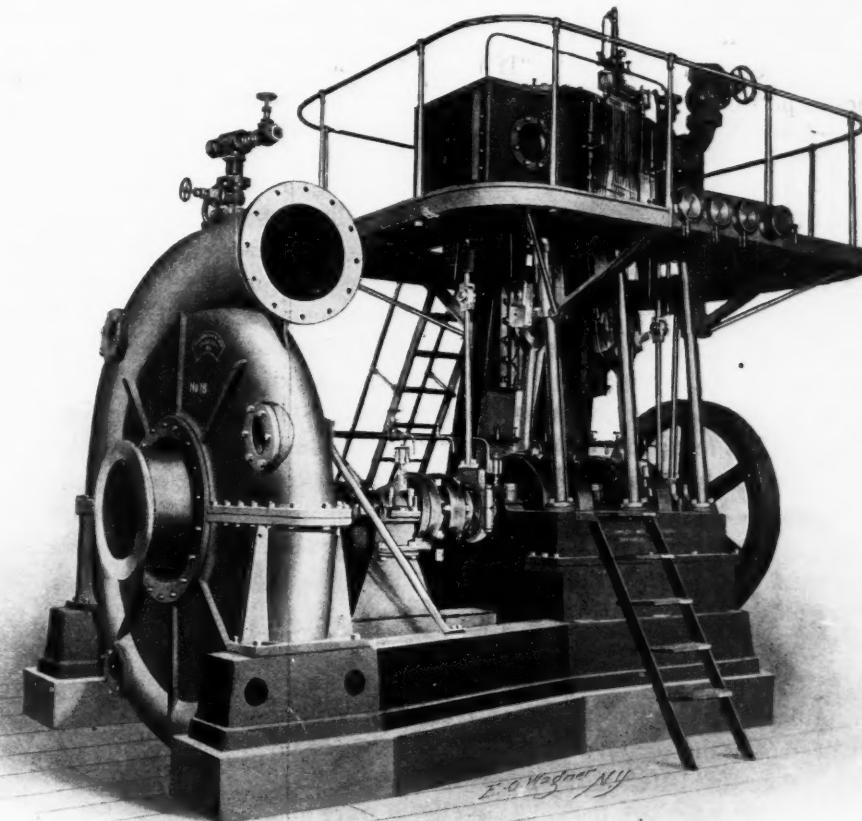
THE city of Norfolk, with a present population of 60,000, occupies an area of about five and three-quarter square miles. Of its 112 miles of streets, only forty-eight miles fall within the category of "improved," the length of sewer-ed streets slightly exceeding this figure. The provision of sewerage facilities was complicated by the physical features of the city's location, this being on a peninsula between the Elizabeth River and what is now called its northern branch, the intervening area being intersected by various creeks and marshes. The average elevation of the territory being only nine feet above mean low tide, a gravity system was obviously out of question, and the necessity of pumping was a principal factor in the adoption of the separate system.

A further difficulty was found in the character of the subsoil—a sandy loam in which the ground-water is generally found at a depth of three feet below the surface. A minimum depth of five feet being necessary to ensure proper inclinations for the house-drains, that depth is adopted for the flush tanks provided at the heads of all lateral sewers, the depth of the system gradually increasing as the sewers gravitate to the pump-wells, where a depth of twenty feet is attained. There are seven such wells at the present time, shortly to be increased by at least two, required for a five-mile extension. The two largest wells have steam-driven pumps, two to each well, the maximum capacity required being 9,000 gallons per minute. The five smaller wells are fitted with five-inch horizontal submerged pumps in pairs, actuated by electric current; they are entirely automatic in operation and require very little attention.

The first pumps installed were simple horizontal water pumps, with plungers adapted for sewage. These were replaced, in the case of the largest and original well—the only one for the first fifteen years or more—by a specially designed Holly pumping engine with brass plungers and inclined valves. The result was not satisfactory, the cost of maintenance, in particular, being excessive. The Morris Machine Company, of Baldwinsville, N. Y., was then asked to co-operate in developing a centrifugal pump, without valves, and especially designed for the local conditions, a leading requirement being that it should be efficient with a widely fluctuating flow of sewage. The first pump of the type ultimately evolved was installed about eleven years ago, a breakdown of the old plant interrupting the official test

and necessitating the continuous running of the new plant for 210 days. As no injury resulted from this severe trial, the city authorities were probably at least as satisfied as if the test had been completed. Other pumps of this type have since been installed and are described as being in first-class condition to-day, although costing very little for repairs since their erection.

Mr. W. T. Brooke, City Engineer, to whom we are under obligations for the data for these notes, cites the use of agricultural drain tiles below the sewer pipes as having



NORFOLK, VA., SEWERAGE WORKS.—MORRIS CENTRIFUGAL PUMP

brought about a highly beneficial lowering of the ground-water. This, in conjunction with the compulsory connection of houses to the sewerage system, is to be credited with a remarkable improvement in the sanitary condition of the city, as evidenced by the reduced rates of mortality. The death-rate for whites and colored people, which stood in 1881 at 25.36 and 40.29 per thousand respectively, fell to 14.96 and 24.47 in the year ended July 1, 1905. Taking the death-rate as a whole, in the same two years, a reduction from 31.17 to 19.11 per thousand was recorded—figures which are vividly reminiscent of the arguments so effectively used by Chadwick, Parkes, Rawlinson and other pioneers of English sanitary reform. From personal knowledge of the first and last named we are convinced that nothing would have been more gratifying to them, had they lived to become aware of it, than this demonstration of the efficacy of their teachings in a country beyond their direct influence but profiting to the full from the labors of their well-spent lives.

JOINT SEWERAGE WORKS

THE Metropolitan Sewerage Works of Massachusetts, described in the opening pages of the present issue of THE MUNICIPAL JOURNAL AND ENGINEER, are at once the largest and most successful example of works undertaken by a joint board with a view to the disposal of sewage produced by an aggregation of individual communities. The appropriation of \$5,000,000, by the Legislature of 1889, for initiating a project which was subsequently to develop far beyond the proportions originally assigned to it, was looked upon as a startling departure from methods hitherto pursued and was, as events have proved, a triumph for those who were sufficiently far-sighted to unite in its advocacy.

A similar project, first given definite shape in the year 1902, contemplates the collection of sewage from important centers of population in the Passaic Valley, extending from Paterson to Newark Bay. This has encountered a succession of obstacles and is at the present moment held up partly through a failure to secure agreement among the populations concerned and partly because of the pending consideration, by the New York State Legislature, of a report dealing with the entire question of pollution in New York Bay. That report, to which further reference will be made in next month's issue, enters at length into the complicated issues involved and will, it is hoped, afford a basis

for definite conclusions in regard to a subject of vital importance to the inhabitants of a large area.

Meanwhile, certain other New Jersey communities, including South and West Orange, and embracing a total area of sixty-six square miles, have effected by voluntary effort what the larger Passaic Valley territory has hitherto been unable to bring about by legislation. Negotiations for the construction of a joint sewer may be said to have begun in August, 1898, when Mr. Alexander Potter, of New York City, was retained as the engineer to make the necessary preliminary surveys and designs. In view of the special circumstances of the case, legislative provisions being conspicuous by their absence, it ultimately devolved upon him to apportion the ratios of cost to be assessed upon the contributory areas—a task which he appears to have fulfilled to the general satisfaction, although a very different result would probably have been no surprise to himself. We hope, in a subsequent issue, to enter into some details of this remarkable work, but may now note that about 145 miles of sewer were laid at a total cost of \$1,680,000. The point of discharge, in Staten Island Sound, is described as being an ideal one for the purpose, the swift current always extending to the mouth of the sewer and sweeping along the sewage as it emerges from the submerged outlet.

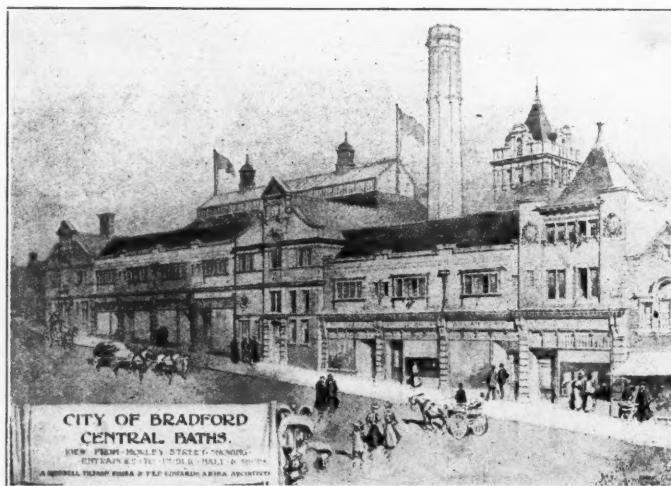
AN ENGLISH PUBLIC BATH

THE provision of public baths and wash-houses was an important item in the sanitary campaign carried on in Great Britain during the latter half of the nineteenth century, the conditions under which the working classes were housed being such as to call for all the amelioration that efforts in this direction could supply. It may be taken as an evidence of improvement that less has been heard, in recent years, of this method of supplying what would now be regarded as domestic deficiencies, but if we may take some cities as affording an example of what has been substituted for the earlier types it must be assumed that the public demand, so far from being satiated, is merely changed in character.

The city of Bradford, an important center of the woolen industry, with a population of 300,000, has recently opened a new central establishment in which slipper, douche, medicated, electric and other still more up-to-date bathing appliances are to be found, to say nothing of Turkish and Russian baths such as are rarely provided by private enterprise, these being under municipal auspices throughout. The illustration below shows a general view of the building, including eight lock-up stores which it is intended to let. There is a swimming bath in a building 130 feet by 60 feet, this being so arranged that it can be floored over in winter and used as a public hall, with seating, including

the galleries, for 860 persons. No details of cost are before us at this writing, but it is scarcely surprising to find that the proposed expenditure was subjected to much criticism during the local election following the decision to embark upon an undertaking regarded by many as beyond the sphere of municipal activity.

Bradford now possesses a complete system of central and district baths, the provision of the latter having been effected for some years past on a comprehensive plan.



Street Cleaning in Cincinnati

THE operations of the Cincinnati Street Cleaning Department, in 1904, form the subject of a report by Superintendent E. Maag, who supplements this by a partial report dealing with experiments in asphalt cleansing during the present year. With a total force of 379 men—forty of the number being "white wings"—much has been done in the way of organizing the work, but regret is expressed that it is impossible to extend the white wing service with the present appropriation, that branch of the service being regarded as the most satisfactory of all.

Much attention has been devoted to the flushing of streets with water, the difficulties in Cincinnati being unusually great, partly owing to the cost of water and partly to the supposed inability of the small sewers to carry off the dirt which would be washed into them. "Some experiments along this line were conducted a few years ago, and we are informed that it was with some difficulty the sewers were relieved of the dirt thus deposited in them." A test was made, in October, 1902, of flushing machines and hose, the cost working out at \$1.22 per square in the former case and \$1.00 in the latter, both being regarded as prohibitive. More hopeful results were derived from trials made, in April of this year, with sprinkling wagons and sweeping machines, the average cost per square being reduced to twenty-two cents. "The work done by this method leaves the street clear of all dirt, and may perhaps obviate the necessity of sprinkling these streets during the day."

Garbage disposal is attended to by the Cincinnati Reduction Company, whose "service has given general satisfaction." A total of 24,327 tons was handled by the Company at an aggregate cost of \$78,500—an average of \$3.23 per ton.

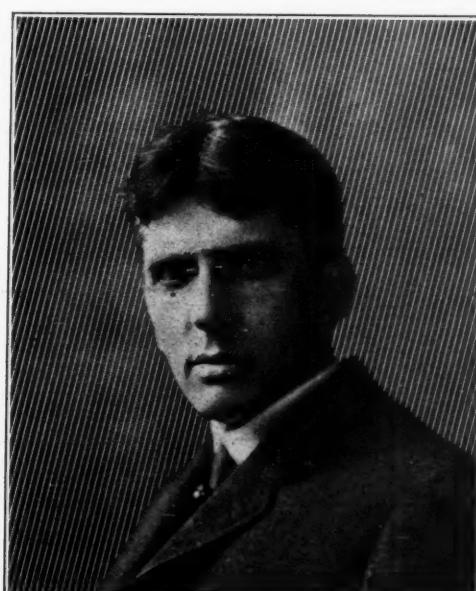
Municipal Street Cars in Liverpool

A RECENT report by U. S. Consul Griffiths, of Liverpool, reveals an eminently satisfactory state of affairs in connection with the street car service of that important English city, where the change from corporate to municipal ownership and operation was effected in 1897. Mr. Griffiths emphasizes the necessity of bearing in mind, whenever, the question of municipal ownership in American cities is discussed, differences in conditions which are not always taken into account. "The fact must not be overlooked that many men in all the larger English cities are not only willing but anxious, after they have secured a competence, which need not necessarily be a large fortune, to withdraw partially, or altogether, from the active responsibilities of business, and devote themselves without reserve or thought of compensation to civic affairs. Wide experience, sane judgment, and strict honesty, are thus secured for the service of the municipality, without the expenditure of a single dollar. This statement applies, of course, only to those who act in an advisory and overseeing capacity." After pointing out that English tramway employees receive smaller wages than the same class in America, he sums up the results of seven years' municipal control in the statement that "three times as many passengers were carried in 1904 as in 1897; the mileage was doubled, and the receipts were increased nearly

90 per cent. Much of the increase is to be attributed to the electrification of the tramway system and to the natural growth of population, but much is also due to economical, judicious, and wise management. Since the city has operated the tramway lines the fares have been reduced nearly one-half; the length of the stage (the distance for which a single fare is charged) has been increased three-fold, and the average speed has been advanced from $5\frac{1}{2}$ miles to 8 miles an hour. The tramway employees were paid about \$194,400 more last year than they would have received under the scale of wages which prevailed under private ownership, and, in addition, proper provision has been made for their recreation and amusement and in case of sickness. An old-age pension is now being considered."

No less significant, especially in view of this being frequently a weak point of British municipal undertakings, is the statement that "the sum of \$2,846,186 has been set aside as a sinking fund reserve, renewal, etc.," while \$490,860 has been contributed toward relief of local taxation and the capital obligation has been reduced by \$539,460. This has been accomplished concurrently with the reduction of fares, increase of mileage, and advance in wages referred to above, and the property has been maintained in good order.

The following extract from the report indicates the growing popularity of the electric car service in Great Britain and, incidentally, the injury to steam railroad interests thereby entailed: "In 1903 there were only five and one-half millions more third-class railway travelers than in the previous year, while the tramways showed an increase of 287,496,000 passengers. The gain in 1904 in third-class railway passengers was a little over 6,000,000, but the tramways gained over 117,000,000 passengers. Since 1890 the tramways have carried each year more passengers than have been carried in the third-class railway cars, and last year the excess was over 700,000,000. An appreciable portion of this excess is from persons who, having the choice of railway trains or electric tram cars, give the preference to the latter. The English railway companies admit the serious character of this competition."



BRAND WHITLOCK, MAYOR-ELECT, TOLEDO, O.

A Financial Report

THE Joint Standing Committee on Finance, of the Pawtucket, R. I., City Council, has issued a pamphlet embodying the report of a firm of accountants on the finances of that city. The firm in question, Messrs. Harvey Chase & Co., of 27 State street, Boston, was instructed to take up this investigation in January last, the work being undertaken under a city ordinance dealing with the city debt and its limitation.

Apart from the satisfactory conditions revealed, the report is of interest as containing a demonstration of the accountants' reasons for recommending, as they do, the adoption of the "uniform system of distribution" originally proposed by the National Municipal League. "This scheme of standard titles and schedules," they observe, "has been accepted in a large number of cities throughout the country and has recently been adopted by the United States Government as a basis for the statistics of all cities prepared by the permanent Bureau of the Census." The accountants include, in their report, a suggested ordinance, prescribing methods of accounting and defining the duties of the City Auditor, prefacing this by a brief statement of the advantages of uniform accounting. In this, account is taken of the viewpoint of city officials compelled to act in accordance with the requirements of statutes and ordinances, and of the position occupied by the ordinary citizen who desires to "know what have been the costs of carrying on the city's functions, how these costs compare with the expenses of other years and whether these costs are higher or lower than corresponding expenses in other cities of about the same size and condition?"

In a covering report, the Joint Standing Committee on Finance recommends the adoption of the uniform system at the beginning of the next financial year. Other recommendations of the experts, it is stated, can be introduced immediately, and the Committee concludes by recommending the adoption of the entire report and draft ordinances submitted therewith.

It should be noted that, since the first practical application of the uniform system referred to above, by the city of Newton, Mass., in 1900, it has been endorsed by many other cities, including New York, Boston, Cambridge, Brookline, Chicago, Baltimore, St. Louis and Minneapolis. The investigation of the Boston conditions, by Mr. Harvey Chase, which resulted in far-reaching changes in book-keeping methods, will be remembered by many who followed the matter at the time.

Water Purification

IN a paper presented to the Boston Convention of the American Public Health Association, by Mr. Allen Hazen, of New York City, reference was made to the great development in the art of water purification which had been made in the United States during the decade 1890-1900. Systematic and thorough studies had shown the nature of the problems to be met and, what was of almost equal importance, that these were often widely different from those which had been encountered and successfully dealt with in Europe. The progress made was illustrated by such plants

as that of the Hackensack Water Company, supplying a population of 100,000 people in the suburbs of New York, and that of the Washington aqueduct, supplying nearly 300,000 people in the National Capital. In addition to these, plants for the supply of Philadelphia are under construction and partly in operation, while actual work has been commenced on filters to supply Pittsburg, Cincinnati, Columbus, Toledo and many smaller cities.

It was shown that increased attention is being paid both to the quality and the appearance of the water delivered by works of this character; the two results are not incompatible, and, in fact, often go together, and the author believes that it is generally worth while to incur the added cost necessary to effect perfect treatment under both heads. The protective influence of effective filtration plants is becoming widely known, but it is very easy to spend too much money on a badly designed plant and then have it fail to meet even the reasonable requirements of the case. The following abstract of the closing paragraphs of Mr. Hazen's paper may be commended to the attention of the increasing number of American cities which, as we have before pointed out, will have to deal with the quality of their water supplies at an earlier or later period—in most cases much earlier than could have been predicated by the designers of the works:

Where a dirty and impure water supply has been replaced by a clean one, either by the use of filtration or by the substitution of ground water or of water from unpolluted sources, the reduction in the general death rate has been prompt and decided. Some of this reduction may have been due to improvements in general sanitary conditions, but this accounts for only a part of it. If the cities where radical improvements in the water supply have been made are compared with those in which the water supply has remained unchanged, the difference in the relative death rates is marked, although other sanitary conditions have presumably improved in all to something like the same extent.

A recent examination of statistics indicates that the greater part of the deaths arising from polluted water, other than from typhoid, are from diarrhoeal diseases and among children. It seems that children suffer particularly from an impure water supply, and the reduction in the death rate of children under five years old, when clean water is introduced, is almost as regular and as striking as the reduction in the typhoid fever rate among older people. The percentage reduction is not as large, but the number of lives saved is much greater. It may be regarded as certain that in the course of the next decade most of the larger cities in the United States will be supplied with water which has been artificially purified.

THE ELECTION OF OFFICERS of the Ohio Police Chiefs' Association, at the Convention held at Springfield, O., resulted as follows: President, R. E. O'Brien, Springfield; First Vice-president, W. W. McDowell, Youngstown; Second Vice-president, T. J. Kelly, Middletown; Secretary and Treasurer, C. C. Smith, Washington Court House; Board of Governors, Chief Kramer, Findlay, three years, and E. L. Foulder, Bellefontaine, two years. The Convention will be held at Youngstown next year.

The Water Meter System

THE experience of Atlanta, Ga., recounted in the following extract from a paper by Superintendent Woodward of the water-works of that city, is merely what might be a much more frequent occurrence if other cities, similarly placed, would grasp the nettle of opportunity instead of weakly treading the time-worn path of precedent and conventionality. For it is nothing better than a conventionality to hug the belief that the inflated consumptions of American cities are either necessary or desirable, and this is, or ought to be, the last country to allow a mere matter of precedent to dictate a policy in this department of public work:—

Prior to 1885 there were no meters in Atlanta. The rate charged for water was regulated by the number of outlets used by consumers.

The consumption of water became so great that it resulted in the necessity of adding to our pumping machinery in order to supply the demand for water and at the same time to give the necessary fire pressure. After a new pump was added and put in operation it was found that the force main leading from the pumping station to the city was too small for the demands made upon it. The loss by friction was enormous, resulting in a great strain upon the pumps and the pipe in the immediate neighborhood of the pumping station, and it was found impossible to give adequate fire pressure.

The only remedy left was to put in an additional and larger main. But the cost of putting in this main was only to be had by an extra rate of taxation being levied upon the people. This was extremely unpopular, and the idea was therefore abandoned, and an effort to arrive at some other remedy was considered. In the meanwhile the insurance companies complained of the insufficiency of fire pressure; and then it was determined to try the meter system. It was known that a large per cent. of the water pumped was allowed to run to waste; and to effectually stop this waste it would be necessary to make the consumer pay for it. So we adopted the universal meter system.

Much complaint was made at the time, it being argued that it was unjust to require water consumers to pay for meters to measure the water they paid for. But the Board contended it was the only equitable way, for it was manifestly unfair to take money from the general tax fund to put meters on consumers in about one-third of the territory of the city where water mains were laid, and therefore require those who lived out of reach of the water supply or fire protection to pay for meters used by those more fortunate in having the comfort and convenience of water supply and fire protection and decreased rate of insurance.

The introduction of meters saved money for the general taxpayers of this city, for without their use the rate of taxation would have been increased in order to raise a sufficient amount of money to pay for an additional main, more pumping machinery, and larger reservoir and other necessary additions to the plant, estimated at that time to cost approximately \$150,000 or more.

As an illustration of the result of the introduction of the meter system here, the pumpage for the month of November, 1884, when we had no meters, was 132,679,900 gallons,

and the coal consumed was 575,000 pounds, being an average pumpage of 4,442,663 gallons per day and the consumption of 19,166 pounds of coal per day.

For the month of November, 1885, with the meters in service, the pumpage was 48,130,000 gallons, showing a decrease in pumpage of 84,549,900 gallons for the month. The coal consumed was 256,000 pounds, showing a reduction in the consumption of coal of 319,000 pounds for the month. The reduction in pumpage was 2,818,330 gallons per day, and in coal of 10,663 pounds per day. If meters had not been introduced our daily pumpage would now be about 25,000,000 gallons per day instead of 8,000,000 as it is, and the outlay necessary to put the plant in condition to meet the demands would have been over a million dollars more than has been spent on it.

Omaha, Nebraska

FOR several years, this flourishing city has fallen out of line in the matter of public reports, none having been published. A change of policy in this respect has been inaugurated by the issue of a bulky and handsome volume embodying the reports of all the city departments for 1904, the production being on a scale and in a style going far to compensate for past omissions. City Comptroller C. O. Lobeck, in an introductory note, expresses the belief that if reports had been printed in past years "the officials would have made fuller reviews and recommendations for the future benefit and administration of their departments," and regrets that the ill health of the Mayor, Hon. Frank E. Moores, prevented the preparation of the usual annual message. Portraits of the members and officials of the city government, to the number of seventy-seven, with views of school and other buildings, form a considerable addition to the usual features of similar volumes.

The departmental reports are given in detail, illustrated in several instances by maps and plans. The report of the City Engineer, Mr. Andrew Rosewater (who is likewise Chairman of the Board of Public Works) states that work in his department, during 1904, amounted to about \$250,000, of which nearly \$100,000 was expended on paving. In this connection it is noted that much attention has been devoted, in Omaha, to the securing of "paving specifications which would provide all the safeguards which an experience of twenty-five years has developed, and at the same time to bring about still better construction than in previous years." The city now has ninety-two miles of paved streets, with 290 miles of sidewalk, many of the latter being of wood.

Eleven miles of sewer and eight miles of house sewer connections were laid during the year, the latter figure being an evidence of the activity in building construction.

CREOSOTED WOOD BLOCK PAVING, which has already been extensively used in Minneapolis, is to be subjected to a series of tests in that city, which should result in much added information in regard to this class of street surface. The U. S. Government Bureau of Forestry will furnish blocks of different kinds of wood, sufficient in all to cover two blocks. These are to be creosoted before laying, and careful records as to wear and other details will be maintained.

Public Ownership in Canada

UNDER this caption, Consul Van Sant, of Guelph, Ont., reports as follows on the success of public ownership of certain utilities in that city:

In matters of municipal ownership this city leads and, more than any other city in Canada, perhaps, is being cited as an example. Guelph owns and controls all its important public utilities, some of which have not reached that degree of development which would lead the impartial observer to pronounce in their favor, while others show the wisdom of public ownership in a city of 12,000 to 15,000 inhabitants, where, carefully initiated and sustained by strict business and non-partisan conditions, they are working successfully. Twenty years ago Guelph invested \$173,000 in the Guelph Junction Steam Railway. The enterprise is now a profitable asset, each quarter showing increased net earnings, the last quarter's net profits amounting to \$3,840. The annual receipts amount to \$16,000.

The Light and Power Committee has submitted the annual report, showing a net profit for the past two years aggregating \$26,172. This includes the gas and electric power supplied the city within the city limits. Gas is quoted at \$1.40 per 1,000 cubic feet. This result has only been obtained by strict adherence to business methods. It includes all legitimate expenditure, as well as charges on \$155,000 worth of debentures of the city, and an adequate amount set aside for depreciation in plant.

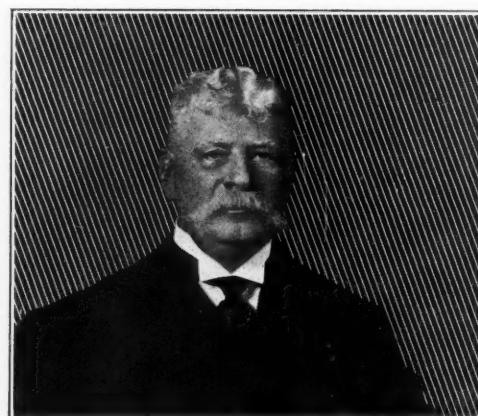
The street railway company shows assets of \$92,157, and liabilities of \$84,112 and an overdraft of \$8,044, representing cost of new cars and rails. The railway was originally built by private enterprise at a cost of about \$150,000. The receipts for the nine months ending June 30 were \$25,435; the net profits \$465. The summer months will more than double this profit. The total receipts show increase for corresponding period of previous year of \$2,830, or 23 per cent., this being the first year the road has ever been run without a loss. The line covers some 8 miles of trolley. The fare, 5 cents, is reduced to 3 cents when \$1 worth of tickets are purchased.

The water-works, with assets of \$151,102, show receipts of \$16,553; cost of maintenance, \$9,397, less credits. The sewer represents a recent outlay of \$87,143, and the receipts for the past year amount to \$15,732, based on charges per front foot.

A MODEL CITY is to be erected by the John A. Roebling's Sons Company, of Trenton, N. J., as a place of residence for the large number of workmen, and their families, employed in the wire and iron works. A site ten miles south of Trenton has been selected as the location of a new rolling mill and provision will be made, in the first instance, for a thousand workmen. Wide streets are to be a feature of this private city, and, in addition, the houses are to stand well back from the street line, with grass plots in front. It is not intended to sell any of the houses or lots; low rents are to be charged and the plans include an ample variety in accommodations, so as to meet all cases. As designed, the city will be self-contained in every respect.

THE GARBAGE CREMATORY AT WESTMOUNT, Montreal, P. Q., to which reference was made on page 124 of the September MUNICIPAL JOURNAL, is now in course of construction, under the supervision of Mr. H. A. Garratt, the Engineer specially sent over by the English firm of Meldrum Bros., Limited, whose designs and estimates for the work were accepted. Col. W. F. Morse, whose New York office is now at 25 Broad street, acts in this country for the firm and took occasion, during Mr. Garratt's stay in New York, to give him ocular demonstration of the difference between American and English garbage conditions. Mr. Garratt, it may be noted, has had charge of many foreign installations of the Meldrum cremators, notably that in Johannesburg, South Africa.

A CHARLES RIVER TRUNK SEWER, draining the upper valley to tide-water, is the scheme contemplated by a town meeting held in Milford, Mass., at which it was voted to recommend the introduction of a bill in the Legislature of 1906. It is proposed that the expense be borne by all the cities and towns in the valley, and by the manufacturers along the river. The lower part of the valley is provided for by the works carried out by the Metropolitan Sewerage Commission of Massachusetts.



ELISHA DYER, MAYOR-ELECT, PROVIDENCE, R. I.

DEFECTIVE PLANK SIDEWALKS IN SAN FRANCISCO are causing much belated searching of hearts in consequence of a Supreme Court decision, awarding a Mrs. Heath \$5,000 on account of injuries sustained, in December, 1902, by falling over a warped plank, elevated above the general surface. Her claim for damages has been carried from one court to another until the Supreme Court has been reached, with the result that the members of the Board of Public Works are held personally liable for injuries received by any person on account of a defective street or sidewalk, whenever it is shown that the Commissioners have not made a proper effort to remedy the defect. Other suits, which have been held back pending a final decision in the Heath case, are now being vigorously prosecuted, and the position of individual commissioners is becoming irksome on account of the surety companies being no longer willing to stand for the \$25,000 bond which each Commissioner has to furnish as a condition of holding office.

An Indianapolis Bridge

THE new Emrichsville bridge, now being built at the entrance to Riverside Park, in Indianapolis, is the last of a series of four large bridges over White river, replacing the old ones rendered unfit for further service by floods in the spring of 1904. Marion county has thus spent upwards of \$800,000 for the accommodation of the traffic between the two parts of the city.

Mr. H. W. Klausmann, County Surveyor, in designing this bridge, took especial pains to make it harmonize with the Park entrance, near which there will be a massive arch with towers on either side. The total length of the bridge is 300 feet. The three arches will be of the concrete-steel type, the piers, abutments and facing being stone. A twenty-four foot asphalt roadway with wide cement sidewalks will lead into the Park boulevard at the north end of the bridge.

When it was seen, a year and a half ago, that the river bridges in Indianapolis would have to be replaced by new ones, the county and the city joined hands and appointed a Bridge and Stream Commission, co-operating with the Commercial Club. This body made a careful study of the conditions, one of the results being a harmonious plan for protecting the banks against the spring freshets.

The work of the Commission has not only been highly satisfactory in a constructional and aesthetic sense, but its members—engineering experts and practical business men—gave the city the benefit of their experience and knowledge free of charge. The contract for the construction of the bridge now illustrated was awarded to the Central States Bridge Company for \$90,000.

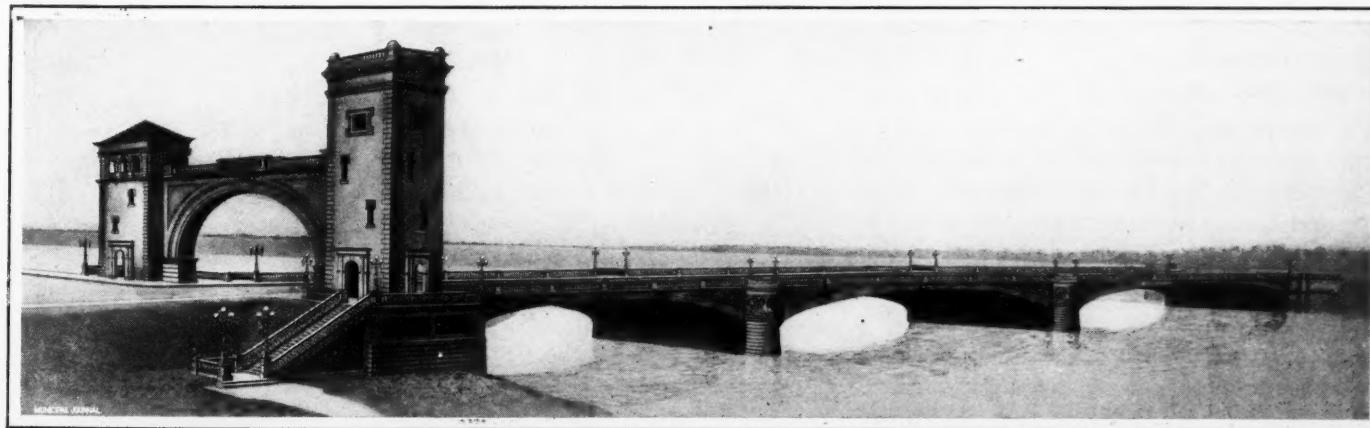
THE PROVISION OF GARBAGE INCINERATORS in this country will be greatly facilitated by reports such as that of the City Engineer of Seattle, Wash., referred to in a recent number of "Construction" (Pittsburgh, Pa.) He appears to have returned from a visit of inspection in England "much impressed with what he saw. He states that he can put up such a building in Seattle without causing any nuisance. In one English city he found a crematory working not more than sixty feet from the City Hall with a cathedral nearby, and a big school on the other side, and he declares that there was not the slightest taint in the air. At Hamburg and Paris the municipal crematories, he says, are really beautiful and ornamental buildings."

Progress in New York City

THE inauguration, on October 25, of the municipal ferry service between Staten Island and Manhattan marks an epoch in the history of the city. The policy of conducting this important service was initiated during Mayor Low's administration, and its realization under Mayor McClellan is sure to be used as the entering wedge for a further advance on these lines. Five steel boats, 250 feet long, and capable of carrying twice as many passengers as any others in the harbor, have been built at a cost of more than \$1,000,000. It has been necessary to provide special slips for their accommodation, work on two of these being still under execution. It is proposed to run the boats on a fifteen-minutes schedule during the rush hours, morning and evening. The total outlay involved will approximate \$2,000,000.

Another municipal enterprise was put in operation on October 30, when Mayor McClellan started the municipal lighting plant at the foot of Delancey street. This is operated in connection with the rubbish incinerator recently constructed by the Street Cleaning Department and the joint installation "thus contrives a double debt to pay." The light refuse collected in a considerable area is to be utilized in furnishing electric light to the Williamsburgh bridge and to seven school buildings. A considerable saving is anticipated to result from the working of the combined plants, which constitute an extension of the idea first applied to the Forty-seventh street garbage installation, from which a satisfactory profit is realized.

THE CONSOLIDATION OF THE BAY CITIES into one municipality is being seriously discussed by a San Francisco association, the Federation of Improvement Clubs. Among the objections being presented against the proposal is the belief that Oakland, Alameda and Berkeley would lose their present independent status and become mere suburbs of San Francisco, the area and population of which would swamp the individuality of the annexed districts. In reply to those, in favor of the scheme, who point to the example of Brooklyn, doubts are expressed whether the consolidation with New York City has been beneficial to Brooklyn. While the arguments pro and con are on the lines familiar to all who have been connected with proposals of this character, it will be interesting to follow the proceedings in a case involving such important issues as those affected around the Golden Gate.



THE EMRICHSVILLE BRIDGE OVER THE WHITE RIVER, RIVERSIDE PARK, INDIANAPOLIS

A Municipal Prize Essay

THE conditions under which the "William H. Baldwin Prize" are to be competed for have been made public by the National Municipal League, the prize of One Hundred Dollars having been established by that body and the subject being connected with municipal government. Competitors in this year's effort must be students registered in any college or university of the United States offering distinct instruction in municipal government, and the subject selected is "Franchise Grants to Gas and Electric Light Companies," with special reference to the following heads:

1. The relative powers of state and municipal authorities in the granting of gas and electric light franchises and in determining the conditions of such grants.
2. The terms of franchise grants to gas and electric light companies, with special reference to conditions existing in a large American city.
3. Efficiency and cost of service to the consumer.
4. The reserve power of the State and municipal authorities over the efficiency and cost of service to the consumer.

Papers must not exceed 10,000 words in length, and must be sent in, not later than March 15 next, to Clinton Rogers Woodruff, Esq., Secretary of the League, North American Building, Philadelphia, from whom a detailed circular of conditions can be obtained.

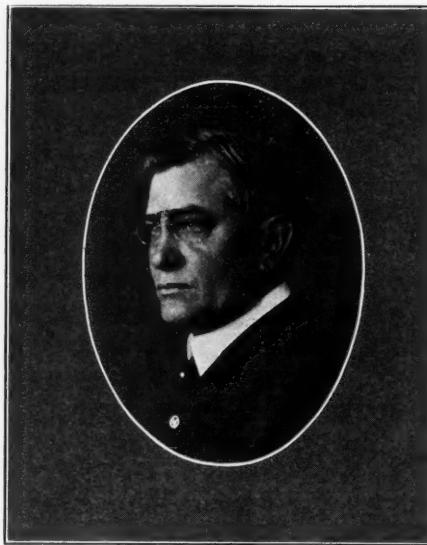
The selection of the subject was dictated, in some measure, by the fact that the "general research topic" for the college year 1905-06 is "The Relation of the City to the Gas and Electric Light Service," a special committee of the League, dealing with the co-ordination of university and college instruction in municipal government, being responsible for this selection.

THE MUNICIPAL JOURNAL cordially welcomes this latest evidence of the League's activity, and joins with it in the hope that it will "enable each competitor to make some contribution to a subject which is of importance to every American community."

THE ST. PAUL GAS LIGHT COMPANY, which now enjoys a monopoly in the main section of the city of St. Paul, may be subjected to competition in the outer "hill district," if the City Council acts favorably upon the petition of the Union Manufacturing Company, which already operates a plant at St. Anthony Park, midway between the cities of St. Paul and Minneapolis, and furnishes electric light to the residents of that suburb. This company has practically agreed to extend its system all over St. Paul, if the Council will grant it similar rights to those of the St. Paul company.

THE CITY OF OAKLAND, CAL., having entered into an agreement with the Pacific Incinerating Company for the cremation of city garbage, has adopted an amended ordinance regulating the gathering and disposal of garbage and fixing fees and charges. Under the agreement, it was provided that no change in the ordinance then in force should go into effect without the consent of the Company, and this has now been given. A distinction between "garbage," "waste matter," and "ashes," formerly existing appears to be partially eliminated by the new ordinance.

THE SLOT GAS METER SYSTEM has obtained a firm hold in England, with the result that a desire is shown for the manifold conveniences of this method of payment in connection with electric lighting. Under average conditions, three hours' light from a sixteen candle-power lamp can be supplied for two cents (the value of the English bronze "penny" used for slot-meters) but there is a mechanical difficulty in the absence of a really trustworthy meter. Human nature remains pretty much the same whether illuminated by gas or electricity, and the same perverted ingenuity which, at first, threatened to nullify the advantages of the slot gas meter has been brought into play against the purveyors of electric light. The difficulty in regard to the cost of installing the wires, etc., for these small supplies is being met by the companies undertaking the charge under certain conditions, defraying this out of the revenue derived from the consumption of current.



CHARLES A. BOOKWALTER, MAYOR-ELECT, INDIANAPOLIS, IND.

THE SANITATION OF CUBA, which has long fallen between the two stools of political opportunism and economy, may (or may not) receive a much-needed impetus through the re-nomination, by the "moderate" party, of President Palma to serve another four years in that capacity. The party platform declares it as one of its objects to "realize all the works of sanitation to which we are obligated without prejudice to others which may be necessary, and will also continue the sanitary service and cleaning of the cities, principal ports and all centres of population which for various reasons should be at the expense of the State; but cities when able themselves to comply with this obligation must cease to require State aid." The loopholes usually existing in campaign documents have, in this instance, scarcely been concealed with the customary adroitness.

A NEW STREET PAVEMENT MATERIAL, known as asphaltine, said to be composed of tar and iron slag, appears to be making headway in England and Germany. In London, where some forty streets have been paved with it, the heavy traffic has had no effect in producing signs of wear, the street surface presenting the appearance of mosaic. It is described as being so elastic, tough, and durable as to resist almost completely both grinding and crushing.

Road Making Machinery

A FEATURE of the movement toward the betterment of city streets is that the municipality often decides to do its own work in this line, as tending toward efficiency in results with economy for the taxpayer.

The city of Jamestown, N. Y., has recently installed a stone-crushing plant of unique design and another for the handling and separating of sand and the different grades of gravel. Both were constructed and installed for the city by the Climax Road Machine Co., of Marathon, N. Y., and are worthy of special mention.

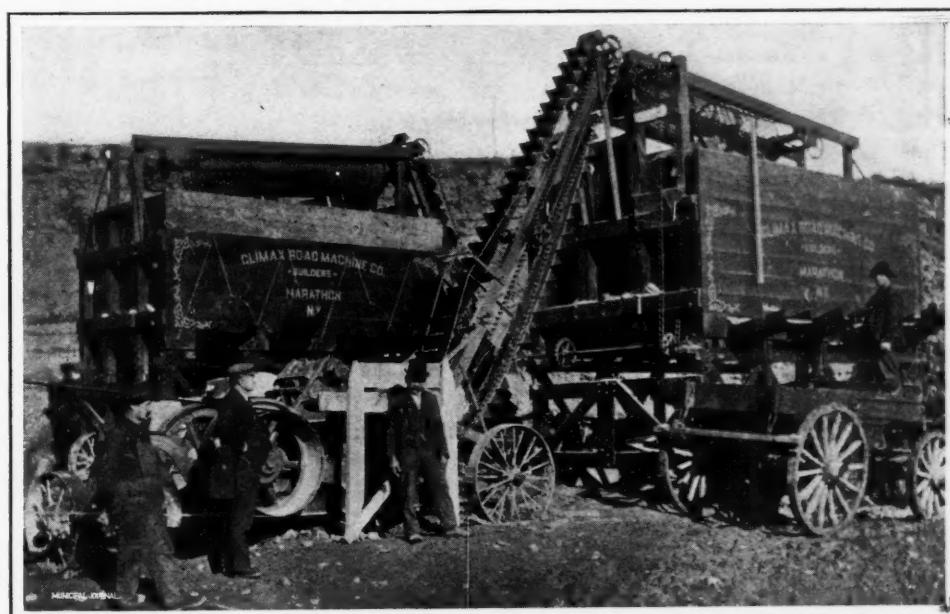
The crushing plant embraces one of the largest size Climax steel frame mounted crushers, with an elevator of the folding type and a 30-ton Climax portable bin. The bin is fitted with a revolving screen and has suitable compartments for the different grades of screened stone. A mounted engine and boiler furnish the power for the plant. A portable elevating and screening plant has been installed by the Climax company at the city gravel pit, with a screen specially constructed for use in sand, fitted with tumbling bars and, in this and other respects, differing from the screens usually employed.

The bins, both at the crushing plant and at the pit, have double delivery, admitting of the loading of wagons from the loading chutes on either side. The power for the screening plant is furnished from a gasoline engine, set on the mounting of the bin and enclosed so that dust and dirt cannot reach it.

Electric Street Sprinkler

THE Edward Balf Co., Street Sprinkling Contractors, of Hartford, Conn., placed an order, early this year, with the

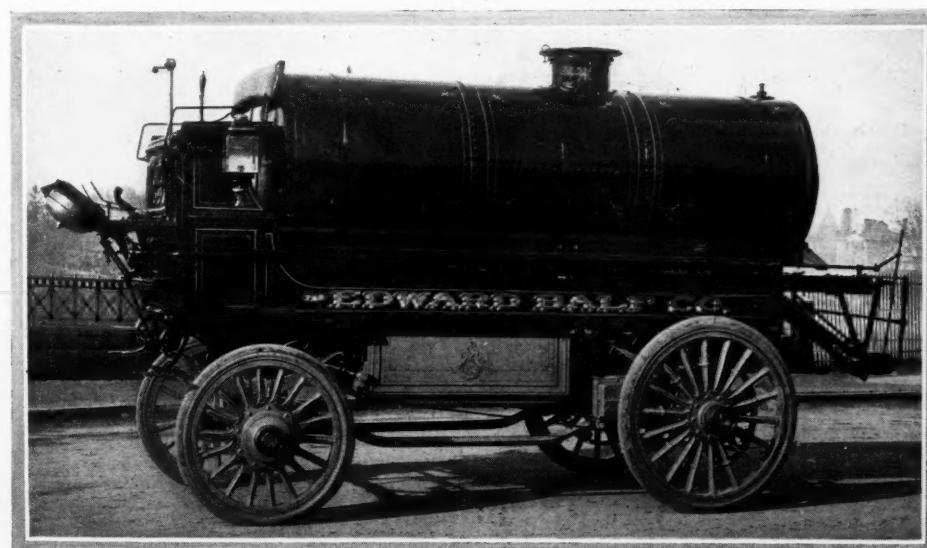
Electric Vehicle Co. for an electric sprinkler. It is pronounced a complete success and has attracted a great deal of attention in daily use on Hartford's principal thoroughfares.



MUNICIPAL ROAD MACHINERY, JAMESTOWN, N. Y.

In general style the sprinkler resembles the ordinary build of horse-drawn sprinkler. The iron water tank is of the usual boiler pattern and has a capacity of 600 gallons. It is mounted on a medium-weight truck chassis, power being derived from an underslung Exide battery of forty-four cells. There are two motors, normally rated at from eight to ten horse-power, and the normal speed is six miles per hour.

The machine covers from thirty to forty miles daily in actual use, or about twice the mileage of a two-horse sprinkler with one change of horses; in other words, the machine does about double the work of four horses. One obvious advantage is that, at times when the sprinkler cannot be used on account of the season or weather, the owner is not obliged to maintain horses in idleness. The work that it does is, as Mr. Balf says, "all to the good."



ELECTRIC STREET SPRINKLER

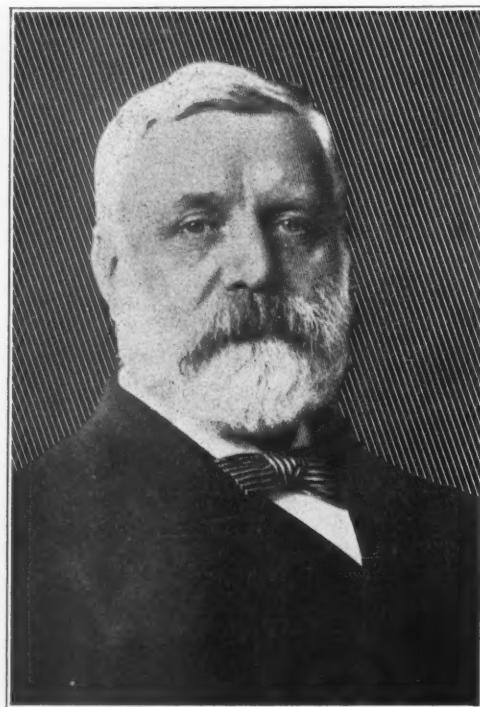
THE STATE WATER SUPPLY COMMISSION appointed by Governor Higgins, in accordance with an Act passed in the last session of the New York Legislature, has entered upon its work. As time goes on, it is hoped to accumulate authoritative data in regard to the source, adequacy and purity of water supplies throughout the State, and a beginning has been made by sending to the city of Syracuse a set of forty-one questions bearing upon these and other points. Dr. Myron S. Falk is Consulting Engineer to the Commission.

Garbage Disposal in Minneapolis

Dr. P. M. Hall, Commissioner of Health, accompanied by three members of the City Council Committee on Health and Hospitals and a representative of the Soo railroad, will visit the cities of Cleveland, O., and Brooklyn, N. Y., early in December, for the purpose of gathering data relative to the transportation by rail of garbage and waste material from collection stations to the municipal garbage plant.

The city's garbage crematory is located about ten miles from the center of Minneapolis, on the line of the Soo railroad. The frame shelter over the Decarie incinerators, together with the receiving platform, was destroyed by fire about two months ago, but repairs have been effected which render the plant available if arrangements were made for the construction of a track to the crematory.

The investigation will, it is hoped, result in the acquisition of valuable information on many important points.



JAMES N. ADAM, MAYOR-ELECT, BUFFALO, N. Y.

THE INTRODUCTION OF FILTERED WATER AT YOUNGSTOWN, OHIO, has been followed by innumerable leaks in the distributing system throughout the city. It is alleged that the mud in the earlier supply served to fill up defects in the pipes, while the filtered water searches out every leak. We should hesitate to accept this theory in the absence of conclusive proof, but this is far from being the first time that strange results have followed a change of this character. The English city of Southampton, something over twenty years ago, changed an extremely hard supply for the luxury of a very soft water produced by the adoption of a softening process. For some weeks after the change the Department was kept busy flushing out the mains to remove the solid matter loosened from the old pipes by the solvent action of the improved supply, and it was some time before consumers were convinced that the change was beneficial.

MR. ANDREW CARNEGIE, in a recent interview in New York, gave expression to his views on municipal ownership, as follows: "I do not believe in the Socialist idea of municipal ownership, but municipal ownership is a certainty as sure as I am alive. Scotland and England are ahead of us in ownership of public property. All Great Britain's water, trams and sewage works are under public ownership. The line seems clear to me. The increase in value made by an increasing population should belong to the city. No city should give away a franchise that belongs to the people, but whether a city could offer it as a lease for a time is another affair. The leases given should be for as short a time as possible. The shorter the better. The ownership should always remain with the city. The people seemingly want municipal ownership and they should get it."

THE VALUATION OF PERSONAL PROPERTY, though subject to some criticism as a criterion of the relative wealth of cities, must fairly be accepted as indicating, in the case of Racine, Wis., a remarkable growth during the last five years. Recent returns of the Board of Assessors show that the valuation has increased from \$2,098,455 in 1901 to \$4,130,090 in 1905, and that no less than \$935,160 is accounted for by last year's increment. Considerable satisfaction is being expressed in the city, not merely over the conditions thus disclosed, but in connection with the recently completed assessment, performed by appointees of Mayor Nelson, whose labors have resulted in a desirable equalization of assessments while largely adding to the total valuation.

A NEW MUNICIPAL LEAGUE is proposed for Virginia, the proposal to hold a preliminary meeting in Richmond meeting with a favorable response from several cities which have been asked to send representatives. Mayor Buxton, of Newport News, to whom the initiative in this movement is due, states that every principal city in the State will be represented, and an address is to be delivered by Dr. Alderman, President of the University of Virginia. Many mayors of cities have assured the promoters of their hearty co-operation in a movement regarded as one of the most beneficial ever inaugurated among the executive bodies of the State.

THE ASSESSMENT OF STREET RAILWAYS for the purpose of Imperial taxation is a matter of much importance to British municipalities, and efforts are frequently made to secure changes in the basis adopted by the Income Tax Commissioners. The city of Manchester has succeeded in maintaining its contention that steel rails come under the denomination of "plant," thus securing a deduction from the assessment sufficient to allow for wear and tear in that part of its undertaking. The city was also successful in its contention that an allowance of 5 per cent. for depreciation should be made upon the *prime cost* of the rolling stock and machinery and not, as had been assessed by the Imperial officials, upon the present reduced value.

Asphalt Paving in New Orleans

New Orleans affords an excellent example of what can be done in transforming dirty and dilapidated streets into



LOADING ASPHALT AT MINES

well laid and well kept avenues of traffic. Canal street, extending from the river to Basin street, is the principal street in the business section, and it is here that extensive improvements to the street paving have left their mark in producing one of the best and widest avenues of which America can boast. The Globe Asphalt Company, of Pittsburgh, was awarded a contract, last year, to pave a total area equivalent to $7\frac{1}{2}$ miles of 30-foot street. The asphalt used, known as the Obispo brand, is mined at Goleta, Santa Barbara county, California, and is being largely used in other cities, including Chicago and New York.

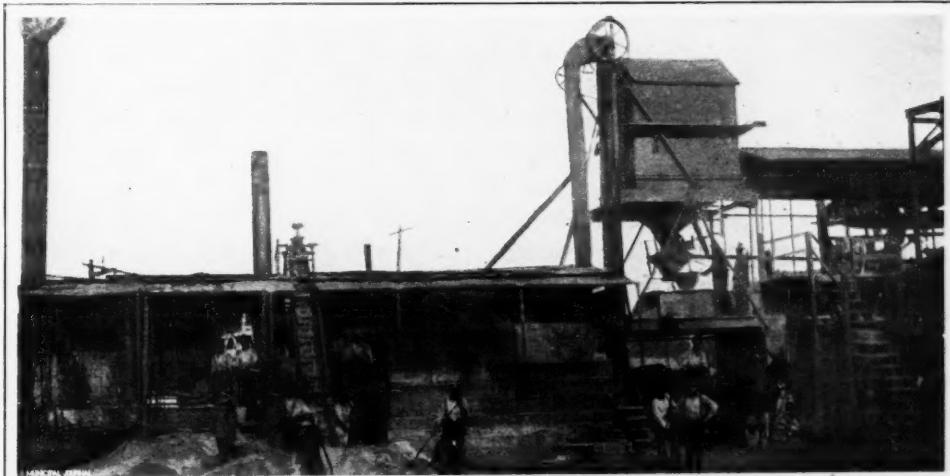
The refinery of the Company is at Obispo, about ninety miles from the mine, but the extent of work undertaken in New Orleans justified the erection of a special refining plant in that city, shipping the raw material from Goleta. By the courtesy of the Company we are enabled to append three illustrations bearing upon the New Orleans work.



LAYING PAVEMENT—NEW ORLEANS

VITRIFIED BRICK ARE ALL RIGHT FOR PAVING in the climate of Charleston, S. C., is the verdict of Mayor Rhett, of that southern city, after a recent final inspection of streets paved with that material, in which he was accompanied by City Engineer Dingle and President Johnson of the Board of Public Works. The Mayor, who was elected President of the League of American Municipalities at the Toledo Convention, in August, referred, during his inspection, to his trip to the North, in which he had enjoyed many opportunities of carefully noting the different brick pavements of Cincinnati, Toledo, Asheville and Knoxville, without finding any work better than that in Charleston. He did not think asphalt so suitable as vitrified brick for hot climates, and there was the disadvantage, too, of having to maintain an asphalt plant for keeping this class of pavement in repair. The brick paving in Charleston is laid with a sand "filler," a feature extolled by the Mayor as affording many advantages over cement or tar.

A MUNICIPAL ELECTRIC PLANT, for which the London County Council intends to seek Parliamentary powers in next year's session, is estimated to cost \$40,000,000. A Parliamentary committee devoted some weeks to the consideration of a similar proposal, by a company, this year, with the result that the bill was thrown out. Opposition to



ASPHALT PLANT USED AT NEW ORLEANS. ERECTED BY HETHERINGTON & BERNER

the Council's bill may be expected not only from existing corporate interests but also from sections of the ratepayers, the growth of London's debt being responsible for a reactionary tendency in regard to the Council's municipalizing policy.

THE RELATIVE DECREASE in the world's dimensions, due to the growth of traveling facilities, is well illustrated by the arrangement made for a train *de luxe*, devoted exclusively to Cuban business, which will leave Chicago every Friday afternoon at two, beginning January 5. The enterprise is due to the Chicago and Alton and Mobile and Ohio Railways.

LITERATURE ON MUNICIPAL TOPICS*

Reviews of Some Important Books—Municipal Reports Received

Books

The City: The Hope of Democracy.—By Frederic C. Howe, Ph.D.—Cloth, large octavo, 313 pages. Price \$1.50—Postage 13 cents extra.

With the best intentions, and with a knowledge of his subject which few will be found to question, Mr. Howe, a Cleveland lawyer, member of that city's Council, and State Senator, has produced a work which will disappoint all but the few who find in Utopian dreams the satisfaction denied more practical souls. He describes it as "an attempt at the economic interpretation of the city," and throws a flood of light upon the causes of much that borders upon hysteria between its covers by the confession that he once held opinions vastly different from those now enunciated with all the fervor of a convert. Starting with the thesis that the corruption, the indifference, the incompetence of the official, poverty, vice, and other evils are traceable to our institutions rather than to the depravity of human nature, he appears willing to conclude that, in what has hitherto been done for civic and social amelioration, all has been for the worst in this worst—or it may still be the best—of all possible worlds. The value of his work lies in the admirable recapitulation of existing conditions—not confined to America—in regard to "the submerged tenth" and other of the lower strata in city life, while his exposition of what it is possible to achieve for the masses by municipal intervention forms a striking contrast to the maintenance of the close preserve in which civic grafters find their opportunity and their reward.

It is when we come to the remedy proposed that we are constrained, while accepting his premises, to differ from his conclusions. It is true that municipal ownership—we are not so sure about operation—would divert the control of public utilities into channels conducive to the earning of revenues appropriate to the city, but a stretch of imagination is involved in the adopted corollary that corruption would cease from the moment that this new touchstone was applied. The same eagerness to ascribe exaggerated virtues to his adopted fledglings is found in the belief that an entirely new system of taxation—applying exclusively to land values—is necessary if justice is to be done. The statement that "houses cannot increase in value beyond their cost of construction" is on a level with the sententious dictum of the lawyer, who, called to advise a client in durance vile, informed him that the law could not put him in prison under the circumstances described. "But I am in prison," came the unanswerable reply of the matter-of-fact sufferer, and, in the same way, it is matter of common knowledge that the value of property *does* increase by farsighted or fortuitous improvement. It will be an evil day when the principal incentive to increased value, whether this be known as unearned increment or by any other name, shall be destroyed as a part of the price paid for a revolu-

tionary scheme of taxation. That grievances and anomalies exist, in this as in other domains of national and civic life, we should be among the last to deny, but we are optimistic enough to believe, at the same time, that the following of constructive rather than destructive lines will most surely and quickly lead to their redress.

City charters are dealt with in a chapter which, as is true of the entire work, affords valuable data and suggestions for the student and the city worker, but the pervading leaning towards iconoclasm asserts itself here as elsewhere. While recognizing the value of Mr. Howe's effort, and urging the study of his collated material upon all who are concerned in social problems, we could wish that he had enjoyed the advantage of collaborating with someone of a different temperament, with a personality strong enough to tone down what we regard as the excessive exuberance of his single-handed production.

Publications Received

Road Red Book, State of New York, 1905.—Bulletin No. 10.

Thirtieth Annual Report of the Board of Commissioners, Department of Parks, Boston, Mass.; year ending January 31, 1905.

Report of the New York Bay Pollution Committee of the New York Legislature. Daniel Lewis, Chairman.

Carpenter and Builder, No. 6—Masonry, and No. 9—Concrete—No. 13, Artificial Stone, Etc.—The Industrial Publication Company, New York. Price, 25 cents each.

The Twenty-sixth Annual Report of the State Board of Health, Massachusetts.—Henry P. Wolcott, M.D., Chairman.

Introducción a la Historia de las Instituciones Locales de Cuba, in two volumes.—By Dr. F. Carrera Y Justiz, Havana.

A Review of the Laws Forbidding Pollution of Inland Waters in the United States. Second Edition.—By Edwin B. Goodell. Department of the Interior, United States Geological Survey, Charles D. Walcott, Director.

"THE STREET RAILWAY JOURNAL," published by the McGraw Publishing Company, of New York City, devoted the issue of September 23rd to the various street railway conventions which made Philadelphia their home during the week of September 24th, and in so doing furnished an example of enterprise and thoroughness which, it may be safely assumed, will hold the record for this leading exponent of the world's electric railway industry for a long time to come. The section dealing specially with the conventions forms a book, the full size of the regular publication, of 440 pages. In addition to 184 reading pages and over 200 pages of advertisements, there is a dictionary of electric railway material and appliances which will alone secure the volume from the fate often pursuing the most ambitious efforts in the line of mere souvenirs, the present production being on quite another footing.

* Any book or periodical reviewed or mentioned in THE MUNICIPAL JOURNAL, or elsewhere, will be sent to any address on receipt of price.

AMERICAN PERIODICALS REVIEWED

The Asphalt Scandal

"THE Independent" (New York, October 26) contains an excellent recapitulation of the stages leading up to the present condition of affairs in regard to the Bermudez asphalt concession and the imbroglio which has been narrowly escaped by President Roosevelt's judicious reconsideration of an awkward question. The article shows that "on the general arbitration, as first planned by Mr. Bowen, it was practically certain that the award would go against the Bermudez Company," and, this being so, everything possible was done to prevent a settlement in that manner. The article thus concludes, the extract from a Parisian journal being especially significant at this juncture: "It is clear that our Government has made a happy escape from its complications due to the misinformation it had received from those who were in the interest and pay of the Bermudez Company, which means the Asphalt Trust. If Minister Bowen's and Secretary Hay's plan of arbitration had not been sidetracked there would have been no further difficulty. All would have been settled by impartial arbitration, but that did not please the conspirators. When general arbitration failed, through Mr. Loomis's confining it, in insulting terms, to the Bermudez dispute, the British and Germans proceeded to arrange their difficulties with Castro by diplomacy, and they are now allied for forty-seven years; while France is now on the point of war with Venezuela, and the United States is planning to back down on Hay's firm policy. The arbitration plan, if carried out, would have settled all these questions agreeably to the interests of the United States, and would have added to our prestige as a nation, and to our influence in South America. Some agreement will have to be made with Castro. In the history of all this bad scandal we are compelled to accept the conclusion reached in the Paris *L'Européen*, a leading European authority on international affairs, which says:

"As to Mr. Bowen, who has been made the scapegoat of this history, he has committed the unpardonable fault of being honest, and probably the only honest man, in a very shameful and dishonorable affair in which a band of conspirators with the complicity of Senators, rich capitalists and their creature in the Department of State, Secretary Loomis, engaged in a deep plot against the integrity and independence of the sister republics, Venezuela and Colombia."

"Simple Honesty"

"The New York Herald" of October 30, discusses, in its Wall Street article, the tendency towards socialism which it finds in present-day indications. While attributing to the Russian disturbances some part of the downward movement in the financial market, it believes that "the campaign of socialism" is measured "to some degree by the declines in the prices of the local traction shares and those of public utility corporations. Possibly this tendency will bring out support and turn the tide in favor of other candidates, running on platforms less disturbing to vested interests than municipal ownership. But to many persons a heavy vote rolled

up as the result of socialistic propaganda would be almost as disturbing as an actual election, because it would mark a tendency which is only too clearly developing throughout the country, and which only last March was successful in its second largest city. One need not ask what has fostered this spirit. The answer is found in such conditions as have brought about the investigation of life insurance companies in this city, and has prompted a President and a former President of the United States, ministers in the pulpit, college presidents in their chapels, bank officials at conventions of bankers, to make the humiliating plea for a return to simple honesty by corporation managers.

"If the red flag of socialism is displayed, it is primarily because the black flag of bribery, corruption and 'graft'—a comparatively new name, this, for stealing—has been displayed at the masthead. We may talk as we will about our great prosperity and our destiny as a nation, but the country has got to raise its standard of political morality and commercial morality and individual morality if it is truly to prosper and reap the benefits of its wonderful natural resources. Men case-hardened to the prevailing corruption in political and corporate affairs may accept the low standards of morality and unite in concentrated effort to raise security prices, or further other enterprises, but those standards will assuredly not be adopted by the masses of the community."

The Denver Trusts

IN the "Arena" (Boston, November) Hon. J. Warner Mills continues his exposure of Trust tactics under the title "The Economic Struggle in Colorado." Dealing, in part, with the Denver City Tramway Company, which has a capital stock of \$5,000,000 and \$5,837,000 of bonds, he shows that the assessed value of the entire plant, including an acquired cable undertaking, was \$2,477,120 in 1905, and proceeds as follows: "The report of 1900 before me shows that the earnings of the Tramway Company for that year were \$1,304,290 and its operating expenses \$722,451, being an increase as to earnings of 5.86 per cent. over 1899, and as to expenses a decrease of 10.44 per cent. Its interest charge for 1900 was \$322,102, an increase over that of 1899 of \$44,927. In 1904 it earned a surplus of \$508,290.26 above the cost of all operating expenses, interest and taxes. This sum is 10 per cent. upon its capital stock of \$5,000,000. Every dollar of this capital is pure "water" as far as the people are concerned. The same is true of the capital stock of the Water Company. Both the traction-plant and the water-plant were built with bonds, and the capital stock in either case does not represent a single dollar of investment. Yet the people must pay rates to these exacting companies that will bring them interest upon the bonds and dividends upon the stock. The market value of the stocks of the two companies is above \$12,500,000, and this sum represents the enormous profit they have made out of the franchises of Denver."

"Jerome Smashes the Machines"

In an appreciative article in "Public Opinion" (New York, November 18) Mr. Albert Britt analyzes the character of "the man who defeated Tammany Hall and the Republican organization single-handed," and testifies to the sincerity and singleness of purpose which have actuated the re-elected District Attorney throughout his official career. The closing paragraphs follow:

"The great reason why New York likes Jerome and stands by him is to be found in its belief in the man's inflexible honesty. Other lawyers know more law, although few can make better use of what they know. Other men are more brilliant, although few have his capacity for making the sparks fly when they strike. Above and beyond this, all New York knows—and when all New York knows the same thing it must be true—that he is absolutely above suspicion of dishonesty or questionable practices. Furthermore, all New York knows the real man. There is nothing hidden about him. What he thinks he speaks with an astounding and sometimes embarrassing frankness. It will not do to whisper to him in a corner, for what you say is likely to be shouted from the housetops. He does not betray confidences; he rejects them. Even his faults—and he has his share of them—are exhibited to the full gaze of the public; and curiously enough the public seems to more than half approve of them.

"How far will Jerome go? His friends don't know, nor do I believe they much care. He has not been nominated for President, or even for Governor, although he could have had the latter a year ago by merely holding out his hand, but if he ever is he will make a campaign worth watching. Meanwhile, he is just Jerome, a good friend, a dangerous enemy, an efficient public officer, and a fearless man, physically, intellectually, and morally. His faults are all on the outside and his virtues are the old-fashioned kind that wear forever and are beyond price."

Municipal Franchises

THE Norfolk, Va., "Landmark," in a recent issue, notes the great changes that are taking place in public opinion with reference to municipal franchises, and counsels extreme caution in the granting of these privileges. "We are just awakening," it says, "to the full financial significance of the scramble for long-term franchises of various kinds in our cities. The small city of to-day is the great city of to-morrow. The metropolis of the nation in fifty years may be right here in Tidewater Virginia. We do not know." Applying these considerations locally, the "Landmark" arrives at the following conclusions:

"1.—The city of Norfolk should own the conduits in her streets and require private franchise-owners to use these conduits, at a reasonable rental, for their wires and pipes.

"2.—No blanket franchises should be granted by the city. Parties who desire heat, light, and other franchises should be required to apply for them separately, and the franchises should be put up at auction and sold separately—provided it is deemed wise to sell them at all.

"3.—In any event, only short-term franchises should be granted. Nothing is more foolish than to barter the future

growth of the city for present attractions. What appear to be concessions to-day might be burdens fifteen or twenty years hence. The lawmakers of small but growing cities should look to the future and be guided by the experience of cities which are already large. If a city grants only short-term franchises, it can extricate itself from errors affecting public utilities before irreparable damage has been done. Mr. Andrew Carnegie, who is not a wild man and who is obviously disinterested, warns the cities of the United States against long-term grants."

The Power of Public Opinion

AN editorial in "The Century" (New York, December) finds the most hopeful aspect of recent revelations in "the demonstration of the soundness of that public opinion which is the mysterious dominator of communities. Those who are interested in the psychology of this element of social advance may find much worthy of study in the developments of the day. One phenomenon to be curiously considered is the question as to the degree of heat, so to speak, required for an explosion of the gases which permeate the ground beneath the social structure. . . . The truth is that every well-informed person in the community not only knew about the political contributions and suspicious lobbying of corporations, but some knew, also, of other questionable performances on the part of the officers of the same concerns. These things were known, were widely bruited, were told of in the press, and yet it took a picturesque and gigantic personal, interior struggle to move public opinion sufficiently to set in motion the machinery of governmental investigation. Now that this has been done, with definite and startling revelations, public opinion has been more and more deeply stirred. A reason for the indignation excited is the discovery that, along with a deliberate system of contribution to political parties, and to lobbyists for doubtful uses, have been methods of business which, at any time, it would have been unpleasant to subject to merciless public inquiry. The result is sure to be not only a reformation of business methods on the part of insurance companies, but a quickening of the business conscience of the whole country."

Hours of Labor

THE "Wall Street Journal" believes that "all the discoveries of science, all the achievements of inventive genius, all the power of steam and electricity, all the wonders of new machinery, would mean little if they did not result both in shortening the hours of labor and in widening the area of opportunity. . . . John Mitchell, in demanding the establishment of an eight-hour day in the anthracite coal mines, asserts that the miners can accomplish more work in eight hours than in ten, and there is probably a large basis of truth in this claim. The world is learning to do more work in less hours. On the whole, those industries turn out the most and the best work where workers are best housed, best treated, best paid and are not overburdened. There has been in the past century a remarkable decrease in the hours of labor in all departments of endeavor. This is not only true in those industries which have the benefit of highly organized

labor, but in other departments of business. Merchants and bankers keep much shorter hours than they did a century, or even a half century ago, and yet accomplish much more in the time they do devote to labor. There is an intenser concentration that achieves more in six or eight hours than was formerly turned out in ten and twelve hours. The world perhaps works harder than it did fifty years ago, but it works fewer hours and has therefore more time for recreation. And this fact is a legitimate proof of the progress which has been made by scientific achievements and inventions. It is quite possible to conceive of a time when by reason of improved processes of production the world will be able to accomplish in five days what has been done with difficulty in six days."

"The Black Flag"

"The Outlook," moved to wrath by recent events, calls attention, in its issue of October 21, to the display of "low moral standards, cheap deceipts, and callous indifference to the rights of others on the part of men of financial and business prominence. . . . No American who loves his country and remembers Emerson's definition of its mission to breed superior men and women can fail to hang his head in shame over the continuous revelation of lack of principle and cheapness of character in men who have been greatly trusted and have proved grossly untrustworthy. The shame of the United States Senate, with several members who have been under indictment or known to be unscrupulous corruptionists; of department officers of high station selling information as if it were produce; of men intrusted with vast funds for purposes which ought to make their custody a sacred charge, greedily using the money of other people for their own benefit—these things are ominous and menacing in the last degree. . . . It is high time for plain dealing; the country is weary of scandals in high places; of men of reputation who are suddenly discovered to be without character; of moral sham and humbug among the eminently respectable. There are too many pious schemers; far too many well-behaved self-seekers. If we cannot be honest, we can at least stop pretending to be what we are not. Let us hoist the black flag and stop sailing as a missionary ship."

The Stupidity of Bosses

"Public Opinion" (New York, November 18) reflects editorially on the stupidity of bosses. "The only thing they really understand is the working power of money. They are helpless in the presence of an aroused public opinion than can not be bought. They forget that man, innately, is decent. They do not read history. They invariably fail to see that there is in our people something that may be called Anglo-Saxonism—something that makes King John sign the Magna Charta, something that chops off the head of King Charles, something that refuses to pay taxes to a mother-government which denies representation, something that frees slaves. The Anglo-Saxon genius is an ultimate insistence on fair play—again the 'square deal.' The Anglo-Saxon will not be driven; he wants to be led. And when he discovers that unconsciously he has permitted some one to drive him he stands up and asserts himself. If bosses

were not stupid they would know this. If they were not stupid they would be decent. But then, of course, they would not be 'bosses.' A man of true foresight can not play dirty politics."

The Cost of Water

"THE Engineering Record" of September 23, in an article on "Water Rates," discusses the influence of other factors than the mere cost of pumping in determining the marketable value of the water supplied to a community. A very large portion of the total expense incurred "is chargeable to what has been aptly termed 'the readiness to serve.' It is this item which is usually ignored by those unreasoning advocates of the meter system who make for it the broad but partly fallacious claim that by meter the consumer pays for what he gets. The cost of the water meter and its setting is much greater in proportion to the average yearly value of the commodity measured by it than is the case with the gas or electric meter; and the reading, inspection, testing, maintenance, and additional clerical work connected with meter bills, each adds something to the cost of the service; so that the total extra expense due to the presence of the meter is by no means inconsiderable. That a disregard of these facts may readily lead a water-works management into financial difficulties is instanced by the case of a certain municipally owned plant, whose revenues were already inadequate, and where the partial introduction of meters in one year reduced the total gross receipts by 33 per cent., with very slight reduction in water pumped and a large increase in expenses."

Gas for Street Lighting

A NEW publication ("Gas and Oil Power," London, October 15), discusses the modern reversion to gas as a street lighting medium, remarking that "a very real feeling seems to be springing up throughout the country that for street lighting gas is, after all, the best illuminant. When electric arc lamps were first introduced, they had to replace the old yellow flame gas burner, and were then unquestionably superior; since that time the introduction of the incandescent gas burner has altered the balance, and, now that pressure gas has been successfully applied to the incandescent mantle, the scale has tipped almost entirely in the direction of gas lighting. Apart from its expense, the fault with arc lighting is that an intense light is concentrated in one place, leaving the intervening space between the lamps in comparative darkness, whereas with gas lighting it is possible to place a greater number of lamps per mile of road, and so obtain a better distribution of light. Further than this, gas has proved itself to be the better illuminant in a fog." The following examples of recent changes in important London streets are quoted from the article, American currency being substituted for sterling: "In Fleet street, for instance, thirty-four gas lamps of over 5,000 candle power, and costing \$1,008 per annum, have superseded twelve electric arc lamps of 6,000 c.p., costing \$1,520, while in other streets thirty-eight arc lamps, of 20,000 c.p., costing \$4,812 annually, have been displaced by seventy-eight gas lamps of 36,000 c.p., costing \$3,700. The change came into force on the 30th ult."

A New Garbage Crematory

THE Sanitary Engineering Company, of 237 Broadway, New York City, has succeeded in evolving a type of garbage crematory which has yielded excellent results under conditions frequently referred to as imposing special difficulties. The destruction of the mixed wastes of American cities is not the comparatively easy business which it has become in England, where the drier character of the refuse materially assists in reducing the severity of the problem. The crematory now referred to recognizes the distinction between the two sets of conditions, and is so constructed that the garbage is first dried, in an upper chamber, by the heat of a lower furnace and then dumped into the furnace itself to undergo the further process of incineration. Plants of this character are in successful use at U. S. Army posts, including Fort Leavenworth, Kansas, and Governor's Island, New York Harbor. In the former case, a population of 4,000 is provided for.

The temperature maintained in the upper chamber is but little above 100° C., sufficient to drive off the moisture. The usual offensive odors, due to this process, are obviated by raising the escaping gases to a temperature of 700° C. (1260° F.) and these gases can then be utilized, under suitable conditions, by inserting a steam boiler in the passage between the crematory and the chimney.

THE FIRST MUNICIPAL LODGING HOUSE, specially designed as such, is to be erected on the south side of Twenty-fifth street, 400 feet east of First avenue, in New York City.

A six-story building, 100 feet by 84 feet, has been designed by Mr. Raymond F. Almirall, of Brooklyn, the architect of one of the Carnegie libraries in that borough, and it is expected that ground will be broken during the present month. Including the cost of land, an expenditure of more than \$200,000 is contemplated, this providing for 628 men and 100 women. The new departure is of considerable interest in the substitution of a building designed with special reference to the purpose in view for the make-shift accommodations hitherto at the disposal of the authorities. Shower-baths will take the place of tubs, and much importance is attached to an installation for disinfecting by formaldehyde gas.

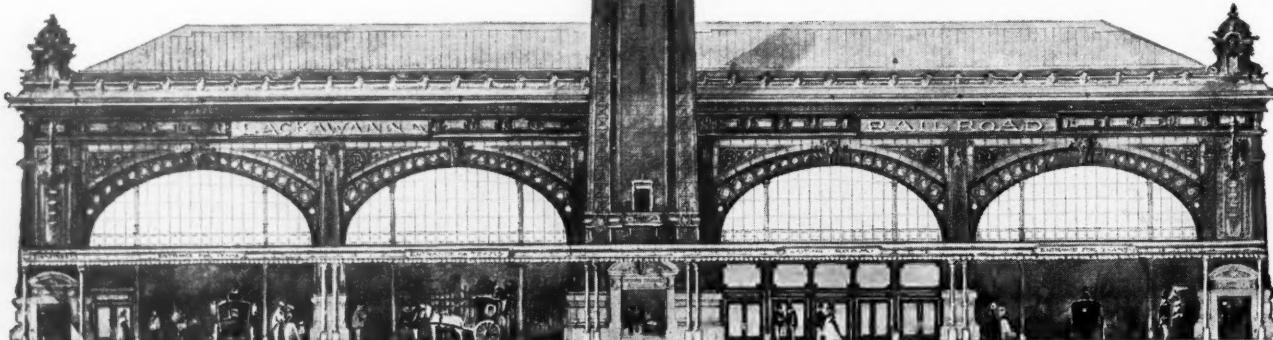
"A SWEEPING VICTORY FOR THE WATER COMPANY" is reported as the result of the long-drawn-out suit between the Long Branch, N. J., Commission and the Tintern Manor Water Company, the chief point at issue being the rates which should be paid by the city for hydrant, sprinkler, and other public services. It is estimated that a decision recently given by Vice-Chancellor Henry C. Pitney will mean an increase from \$5,250 to \$7,500 in the city's payments for these purposes. Another branch of the decision deals with the rates payable by all-round consumers; these are to remain as before, but summer residents will in future have to pay a two-thirds rate for the winter months. But this concession has a string to it in the fact that disconnection and consequent reconnection, at the cost of the consumer, will have to be carried out in each case where the rebate is claimed.

A NEW FERRY TERMINAL

THE MUNICIPAL JOURNAL had something to say, in its September issue, concerning the unfortunate tendency towards unadorned utilitarianism in the construction of American river front erections, instancing the recently burned Lackawanna wharf at Hoboken as an example to be avoided. The same Company's new ferry terminal at West Twenty-third street, on the opposite side of the river, is of a totally different type, steel being used throughout its construction and the front being protected by ornamented copper. The total length of 523 feet provides room for three ferry slips, with commodious waiting rooms

on the first and second floors. The clock tower, 135 feet high, forms a conspicuous landmark for some distance up and down the river and assists in emphasizing the importance of the new building in the group of railroad stations at that point.

In another respect, also alluded to in our earlier reference, the Company bids fair to create an improved opinion, in regard to New York's passenger facilities, in the minds of visitors from other countries, the establishment of an electric cab and carriage service between the new terminal and "uptown" being eminently calculated to remove an existing ground of reproach.



THE LACKAWANNA RAILROAD'S NEW FERRY TERMINAL AT WEST TWENTY-THIRD STREET, NEW YORK CITY

Tests for Asphalt

WITH a view to guarding against the use of inferior material as the cementing medium in asphalt paving work, the Globe Asphalt Company, Pittsburg, Pa., and Los Angeles, Cal., suggests the embodiment, in the specifications, of the following test clause. Bidders would be required to furnish an 8-ounce sample of the asphaltic cement they propose to use, this to be treated as follows:

A determination of the percentage of asphaltine and petroline is made with a Soxhlet extractor, using ether for the extraction of the petroline and chloroform for the asphaltine. Then another 50 grams of the submitted asphaltic cement is placed in an oven or water bath, in a 500 cc. Erlenmeyer flask, the contents being kept at an even temperature of 212° F. for ten hours, during which the molten cement is gently agitated by having a stream of air carried in and to the bottom of the flask through a glass tube and there allowed to escape and ascend through the cement. At the end of the ten hours of agitation, the sample is again analyzed and the petroline and asphaltine percentage determined, as in the first instance, and if it is found that more than 2 per cent. of the petroline has been converted or oxidized into asphaltine the asphaltic cement will be rejected.

Samples of the asphaltic cement used by the contractor shall from time to time, while the paving work is in progress and as the City Engineer shall direct, be taken by the City Chemist or other City official from the asphalt tank or tanks at the plant of the contractor, and, when found not to comply with the above requirements, the material shall be rejected. The contractor shall remove from the street any paving in which the asphaltic cement does not comply with the above requirements, replacing same with new and proper material at his expense.

Activity in Fire Department Sales

CONTINUED activity is exhibited in the sale of fire fighting appliances, which ranges over all sections of the country. Many fire engines are being rebuilt and orders for new apparatus continue to be received. New York City, Cincinnati and Toledo, O., Baltimore, Md., Kansas City, Kan., and many other cities and towns are preparing for the winter along fire protection lines, and the American-La France Fire Engine Company, Elmira, N. Y., has received many orders for fire engines, aerial trucks, combination wagons and other apparatus. Among these was one from New York City for two first and two second size Metropolitan Steam Fire Engines and one from Cincinnati, O., for two first size Metropolitan engines. New York City, Huntingdon, W. Va., and Newburg, N. Y., each ordered a 65-foot American-La France aerial truck, the first-named city also ordering an 85-foot aerial truck. Chemical engines have been sold to Fairfield, Me., and St. Boniface, Man., and combination wagons are being built for Johnstown, Pa., and Atlanta, Ga.

Among earlier work in the same hands may be noted twenty-nine new fire engines, in addition to twenty-three being rebuilt. Of other apparatus, shipments, orders and construction work included thirteen aerial, six city and four plain trucks, sixteen chemical engines, fourteen combination wagons, five combination trucks, seven hose wagons, one water-tower and a racing cart.

Not on Sale

THE growth of American manufactures is strikingly shown by the dimensions of a volume—"The Manufactures of the United States"—which has reached its fifth edition. Its 2,700 pages contrast with those in the original pamphlet of less than fifty, issued in 1882, and its references to more than half a million manufacturing concerns with those in the original pamphlet of less than fifty, issued in 1882, are ample reasons for the extended circle of subscribers secured by this valuable register. The volume, which is not sold, but loaned to subscribers at \$15 per year, is published by the Manufacturers' Red Book Publishing Company, 225 Fourth avenue, New York City.

Pumping by Compressed Air

THE Ingersoll-Sergeant Drill Company, whose main office is at 11 Broadway, New York City, has issued a new catalogue (No. 73) in which full details of the Pohlé Air Lift method of pumping are given. It is curious to note, in regard to a system which has been so extensively developed and used since its original invention by Dr. Pohlé, that opinions still differ as to the true theory of its operation. There can, however, be no dispute as to the advance which has been made in adapting this ingenious application of natural forces to the varied uses of the hydraulic engineer. The air-compressor required need not be placed near the pump-well, but wherever the expense of attendance is least, the compressed air being conveyed from the adjacent receiver to the well by ordinary steel or iron pipes.

The catalogue illustrates many actual installations under varying conditions and with the plant modified to suit them. A glance through its pages will suffice to show the progress made since the time when the Lift was the subject of more or less satirical references in lecture halls and technical coteries.

Street Cars in New York

A RECENT issue of the New York "Globe" gives prominence to the added facilities afforded citizens in general, and patrons of the New York Central Railroad in particular, by the establishment of a through car line running via Fourth avenue and Twenty-third street to the West Twenty-third street ferry stations of the Pennsylvania, Erie, Delaware, Lackawanna and Western, Central Railroad of New Jersey, Philadelphia and Reading, Baltimore and Ohio, and Lehigh Valley. This service was inaugurated on Monday, October 23, with cars running on a headway of approximately four minutes, from 7.30 A. M. to 7 P. M., and passengers arriving at Grand Central Station who desire to take this means of conveyance across the city, or to reach the shopping district or any other point on the line designated, are enabled to do so without transferring.

A Patent Gutter Plow

A COMPARATIVELY inexpensive machine for cleaning paved gutters where sand and mud have accumulated from adjoining unpaved streets is being introduced by J. H. Strain, 12 Elm street, New York City. It can be used for snow, the beam breaking down the ridge so as to allow teams to approach the curb, and will work in any depth of snow that horses can travel through. The operation of the machine by the foot leaves the driver's hands free to handle his horses. Used after each snow storm, gutters can be kept clear of ice and snow, thus facilitating the flow of water to the catch basins. These advantages qualify the plow as a necessary part of a municipal street cleaning equipment.

Technical Publicity Association

THE following officers were elected at a recent meeting and banquet of the Technical Publicity Association: C. E. Morse, Ingersoll-Rand Drill Company, President; H. M. Cleaver, Niles-Bement-Pond Company, First Vice-President; Frank H. Gale, General Electric Company, Second Vice-President; Rodman Gilder, Crocker-Wheeler Company, Secretary; H. M. Davis, Sprague Electric Company, Treasurer; Graham Smith, Westinghouse Companies, and Charles M. Manfred, Johns Manville Company, members of the Executive Committee. The banquet was followed by an informal discussion on the advertising appropriation.

A New Address

MESSRS. BURNS & McDONNELL, Civil, Hydraulic and Sanitary Engineers, of Kansas City, Mo., have removed their offices to larger quarters at 709 and 710 Dwight Building, where they will continue their practice as specialists in these lines and municipal engineering generally.

Sand Driers and Asphalt Plants

THE accompanying illustration represents a new portable sand heater or drier, brought out during the present season by Hetherington & Berner, of Indianapolis, Indiana. A steel carriage, with broad-faced steel traction wheels, supports the drier and the necessary engine and boiler. The power supplied is sufficient to operate an asphalt mixer, so that by using this drier in connection with a portable melting kettle and mixer a very compact and efficient paving plant is obtained, ample for keeping up repairs of asphalt streets and even for carrying out small contracts for new work. A plant of this sort, operating in Saginaw, Michigan, during the present season, has surprised all concerned by reason of its efficiency. Another arrangement is without engine and boiler, the motive power derived being from another source, say a portable or farm engine or an electric motor. The drier is of the well known Hetherington type, now recognized in the trade as a standard.

During the season just closed the firm has sent out three of its new style one-car railway plants and three stationary plants, one of the latter being of the highest class and greatest efficiency, with a capacity of over 4,000 square yards of finished pavement per day, complete with "binder" and 2-inch "topping"; it will turn out binder and topping simultaneously. It has been erected in Chicago for the Parker-Washington Company.

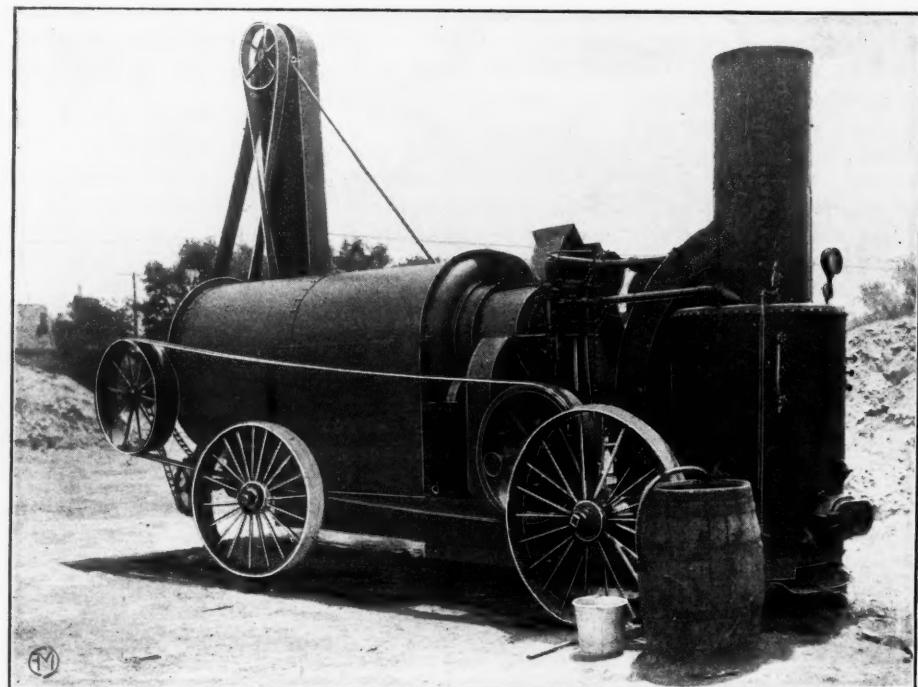
The popularity of the Hetherington & Berner paving plants, as well as the firm's other lines of machinery, has been so great that the company has been compelled to undertake a very considerable expansion of its facilities. To that end it has purchased a new factory site, three and one-half acres in extent, and is working upon plans for a model manufacturing establishment. It is intended to bring out a line of first-class steam rollers, also steam shovels and contractors' machinery generally.

A New Hydraulic Ram

ONE of the most important requirements in every home as well as in every town or village is an ample water supply at a moderate cost. This problem has been studied by various engineering firms, and the Rife Pumping Engine Co. claims to possess the best system

for that purpose where the supply has to be artificially raised, as is frequently the case.

The Rife Hydraulic Ram is based upon an application of established principles, and by its use water at a low head may be made available for raising a portion of the same or other water to a higher level than the supply. A constant flow of water can thus be obtained

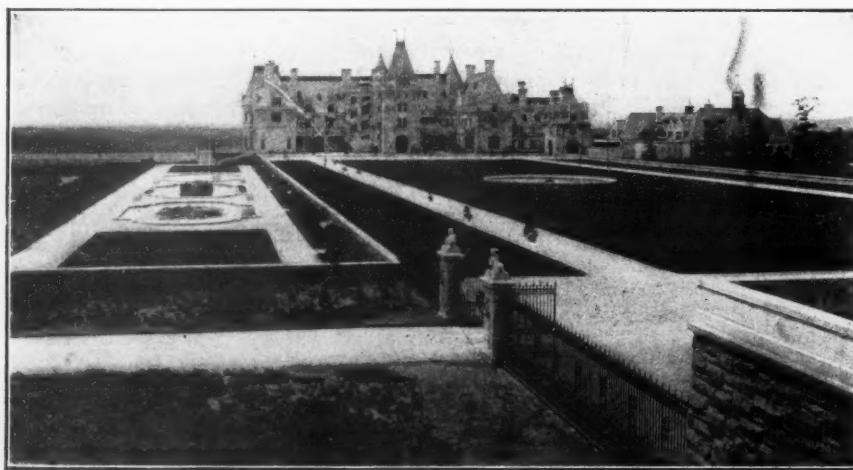


A PORTABLE SAND DRIER

without any trouble or expense except the replacing of a valve once in about two years. A plant of this type has been equipped for supplying water to the town of Bristol, the capacity in this case being 100,000 gallons daily. The smallest size made will deliver about 500 gallons in twenty-four hours.

Small rams have, of course, long been used, but the difference in the results derivable from the improved Rife model is shown by a test made by the U. S. Government on a plant installed for it at Narragansett Bay, where the efficiency developed was over 91 per cent., this contrasting favorably with results obtained from old-fashioned rams. The Rife Company has a great number of satisfied customers in America and elsewhere, many of the largest estates in the country being equipped with its engines. The ram will elevate water thirty feet for every foot of fall used, it runs continuously and is absolutely automatic. The manufacturers offer to install it under contract to cover all the work and with an absolute guarantee as to results.

The descriptive catalogue of this pump will be found useful by those interested in the best means of procuring a good water supply, and can be obtained by addressing the Rife Pumping Engine Co., 111 Broadway, New York City.



THE RIFE HYDRAULIC RAM

Connections to Large Water Mains

THE largest contract ever awarded for making connections to water mains, without shutting off the water, was awarded to the Water Works Equipment Co., of 180 Broadway, New York City, by Contractor Thos. O'C. Sloane, of 76 William St. The connections to be made include 350 6-inch connections of 20-inch and 30-inch mains, required to locate new hydrants in various parts of the Borough of Brooklyn, N. Y.

Sader 1808

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AND ENGINEER

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DECEMBER, 1905

Reading Matter for Public Officials

In view of the lack of knowledge regarding municipal and public work of many men who enter upon public duties, the MUNICIPAL JOURNAL AND ENGINEER ought to be required reading for city, county and township officials. Nowhere can there be found within a small compass such a variety of valuable information upon the administration of municipal affairs. The man who reads the MUNICIPAL JOURNAL AND ENGINEER regularly cannot plead ignorance as an excuse for a failure to discharge his duties to his constituents. The regular reading of the MUNICIPAL JOURNAL AND ENGINEER is a liberal education.—"Oakland Enquirer," Oakland, Cal.



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Elected to office during the past month, who carefully investigate the subject of

STREET CLEANING

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The Street Flushing System of Street Cleaning

as the most thorough method of keeping all kinds of pavements free from dirt. The only automatic flushing machine in successful use by municipalities throughout the country, and giving complete satisfaction wherever introduced is

The Sanitary Automatic Flushing Machine

Endorsed by Mayors, City Engineers, Street Superintendents, Councilmen, Health Departments, etc., as well as by the merchants and citizens of every city where used.

A reputation for clean streets is a valuable asset for a municipality, and a subject so vital to the health of a community is worth immediate investigation.

Let us send you our printed matter on the subject, showing how other cities are profiting by the use of flushing machines. Please address us to-day as below

Sanitary Street Cleansing & Sprinkling Machine Co.

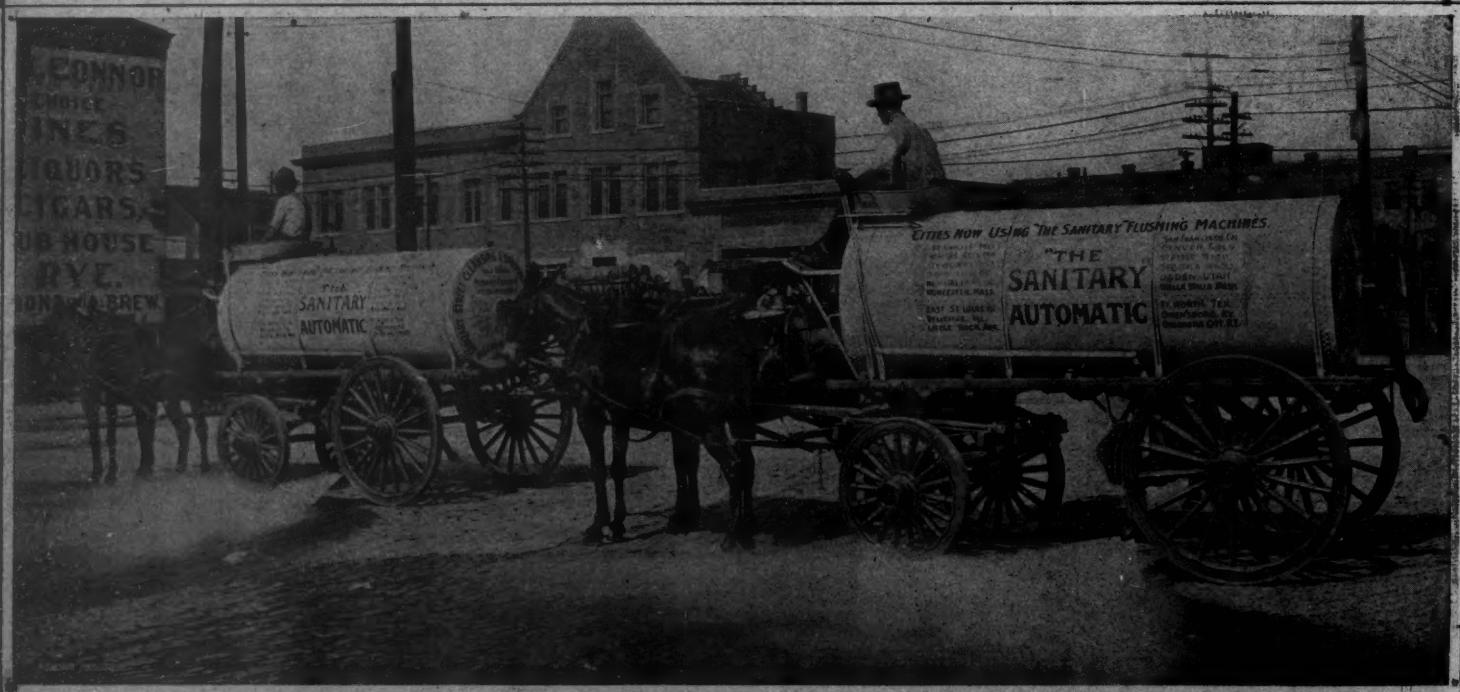
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Contracting Office, Suite 1318-22 Chemical Building

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There are some inferior and impracticable imitations of our machine. Specify the "Sanitary Automatic."



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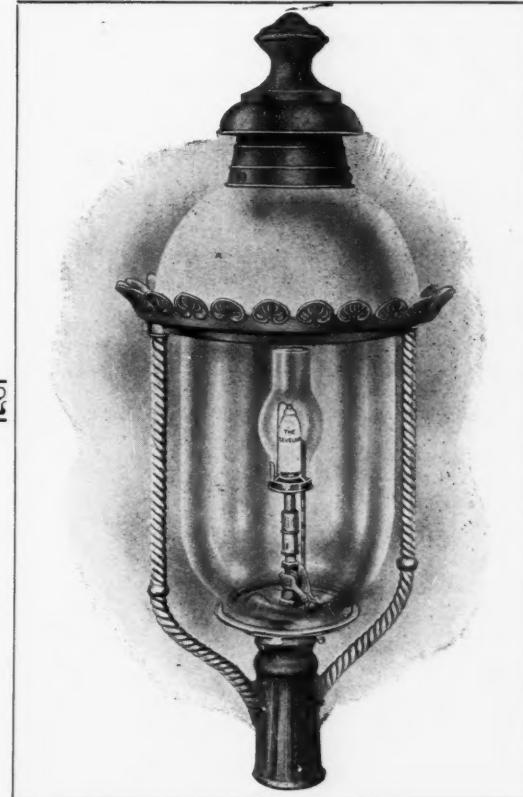
IS the result of using the mantle gas or naphtha lamp in connection with the electric arc. Street lighting experts agree upon this statement:

WHY THE MANTLE LAMP IS PREFERABLE

*It affords a better distribution of light.
It lights shaded streets perfectly.
It is the most economical any city can adopt.*

The CLEVELAND SYSTEM is SUCCESSFUL

indicated by our being again awarded the contract with the City of St. Paul for 6,500 lamps. Minneapolis awarded us a contract for 3,500 lamps because of the success of our St. Paul contract. Pittsburg has contracted with us for 4,000 lamps. Some of the other cities using our lamps are Boston, Charleston, Memphis, Muscatine, Ia., Lincoln, Neb., Madison, Wis.



Our Boulevard Gasoline Lamp makes it possible to obtain the same results as from the gas lamp where gas mains do not extend. We will guarantee any town or city a big saving in its lighting bills and a service that cannot be equalled. Write us for particulars.

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EFFICIENT, SIMPLE, DURABLE

Minimum Expense for Operation
and Maintenance

Burns Garbage and Refuse quickly
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A new appliance for automatically operating sluice, gate or flap valves either single or in series.

Capable of being used as timed valves for draining filters or contact beds, also for discharging contents of a tank dosing onto a number of filter or contact beds in rotation, or of rotating a continuous flow upon a series of beds without loss of head. Simple, reliable and better than siphons.

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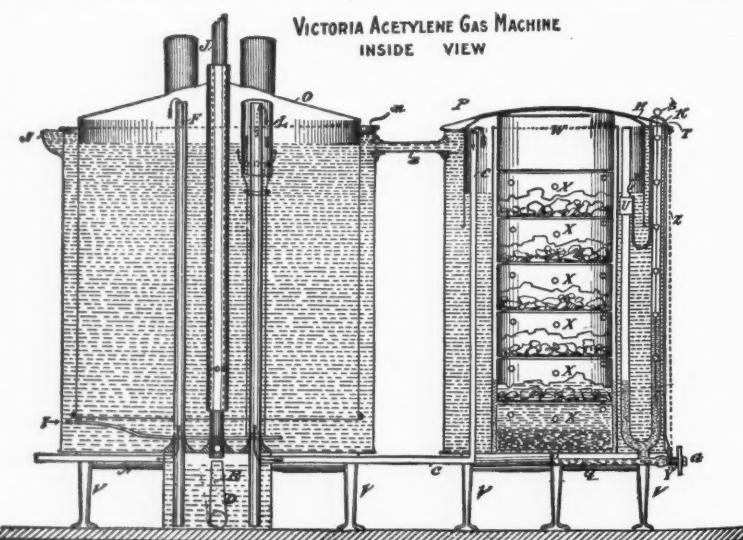
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IS ABSOLUTELY SAFE

We have a standing offer of \$100 to any person who can suggest
any way by which this generator can be made to do damage.

For Town Lighting it gives the most Gas for the Least Money, Results—DIVIDENDS



This Acetylene Generator has but one working part—a lever—and no valves to get out of order.

2 x 3-12 lump carbide costs less and gives 20% more gas than the granulated, therefore a drop feed generator using a smaller size is not to be considered.

To obtain the best gas cool generation must be produced. The VICTORIA does this.

Labor costs money. The VICTORIA requires the least time and attention.

It has no valves, rubber gaskets, stuffing boxes, cams, springs, toggle joints, uses the largest size carbide, uses less water, makes absolutely cool gas.

John Simmons Company

96-110 CENTRE ST., NEW YORK CITY

See Descriptive Article in April Issue.

Mention Department A G

The Imitation and the Genuine



Main Street, Paris, Ky. Imitation Bitulithic laid in 1904. This photograph taken August 11th, 1905.

Imitation is said to be the sincerest form of flattery, but results are seldom to the credit of the imitator and the merits of the thing imitated are rarely enhanced in the eyes of the observer, if his only knowledge of the original is that obtained from his inspection of the spurious.

Paris, Ky., awarded a contract for a street pavement represented to be as good as Bitulithic. The price per yard for the counterfeit was a few pennies below that asked for the genuine.

*Look at this
picture—*

 *and then
on this—*

Can any municipality be so short sighted and lacking in good business judgment as to take such chances with an imitation? Can you reasonably expect an imitation, based purely on guesswork, to be the equal of the genuine? Is the penny-wise-and-pound-foolish policy ever a paying investment?

When you need any article get only the genuine. If you want to invest in a gold brick, buy the imitation.

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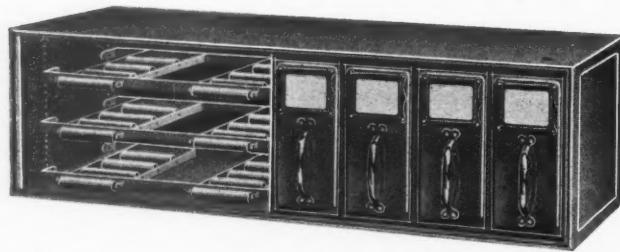
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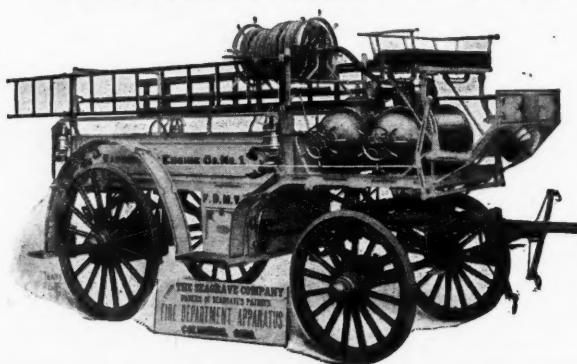
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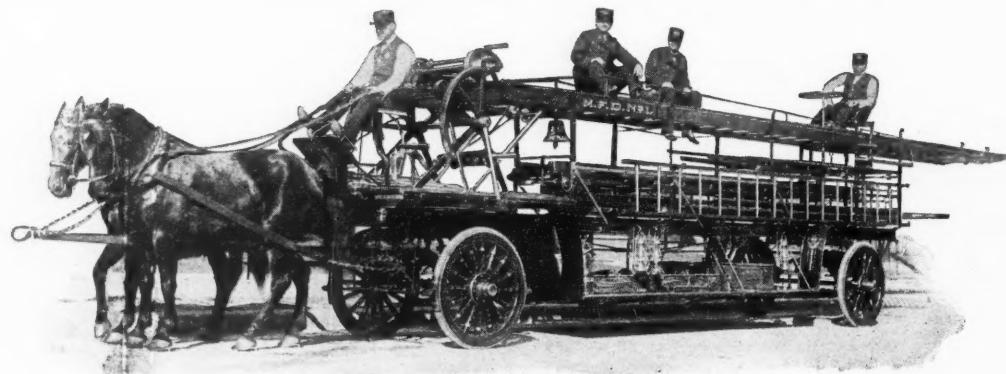
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VOL. XIX

DECEMBER, 1905

No. 6

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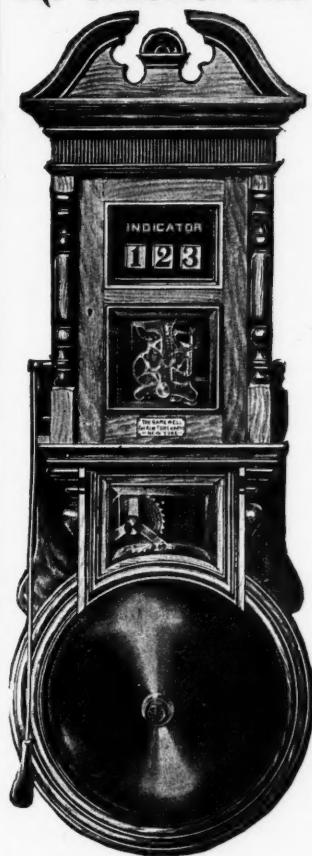
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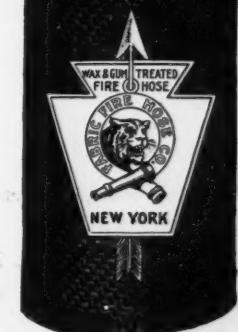
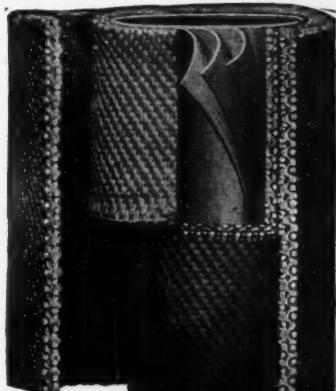
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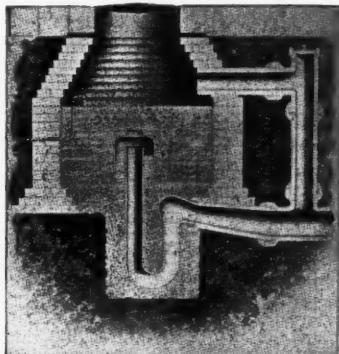
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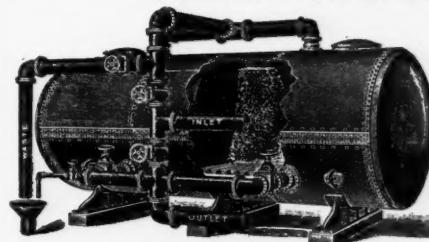


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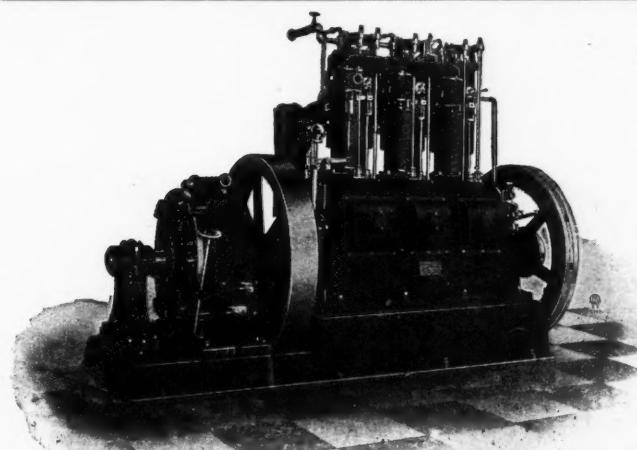
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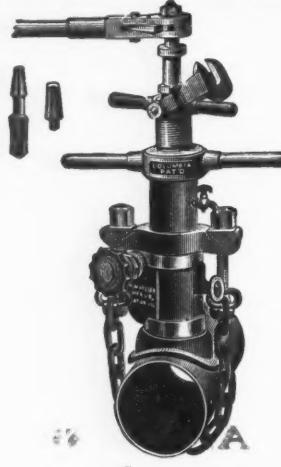
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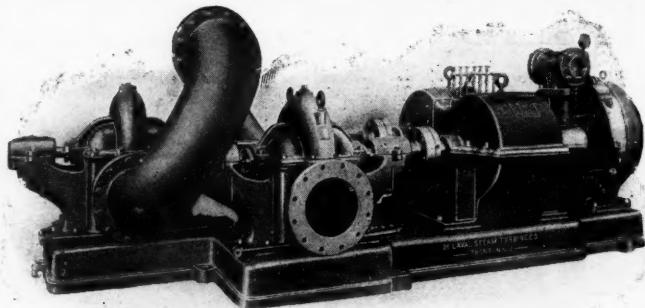
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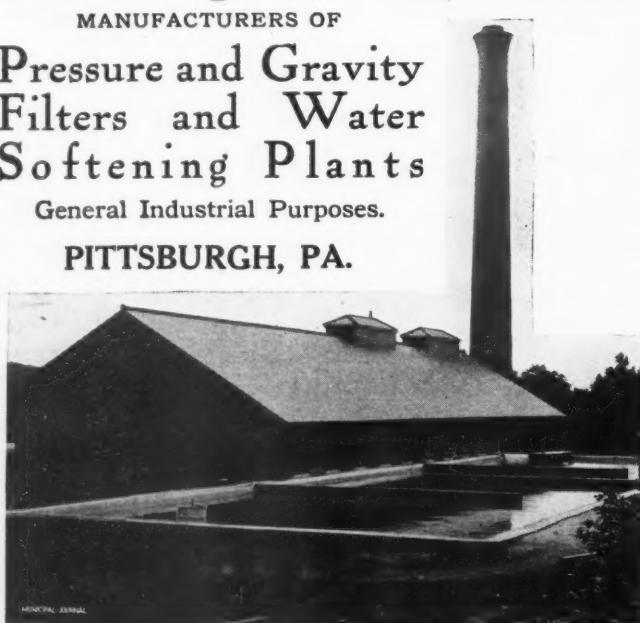
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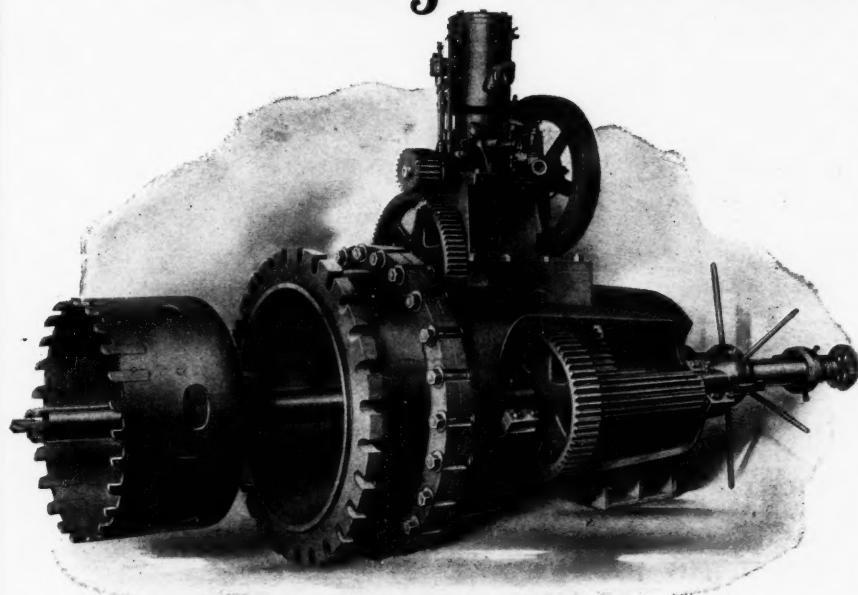
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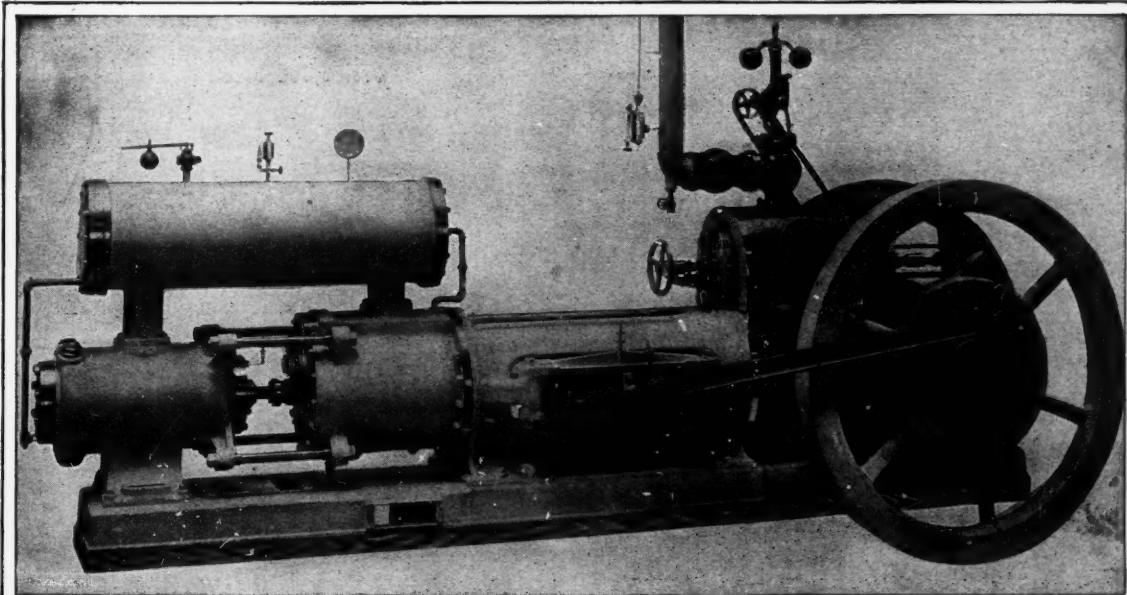
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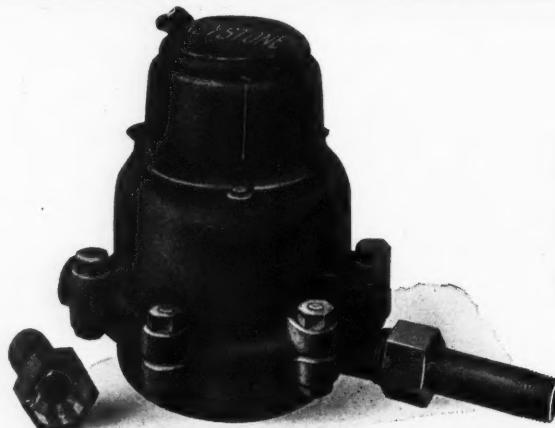
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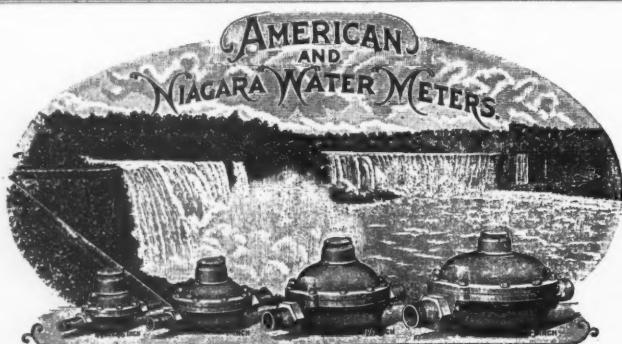
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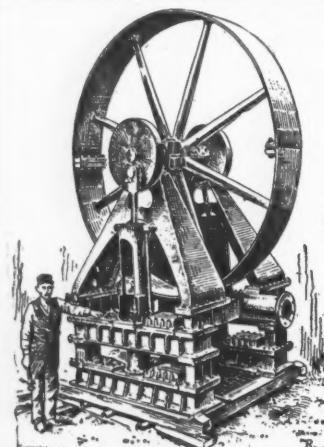
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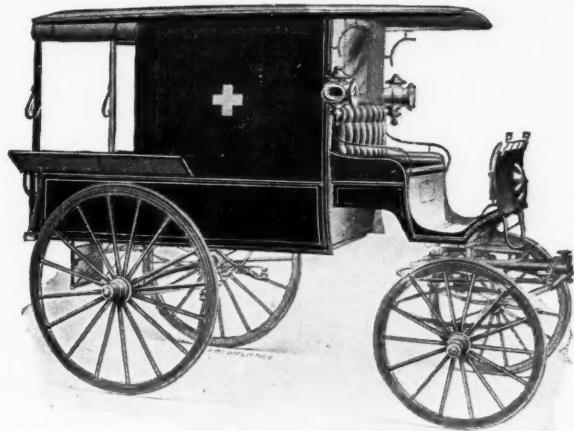
A SPECIAL committee of the Baltimore City Council, which made a tour among bitulithic pavements in Boston and Pawtucket, appears to have been fortunate in seeing a large variety of streets, exhibiting this material under diverse conditions. The committee's report states that the pavements generally were free from cracks or holes and were in excellent condition. For instance, near the State House, Boston, where there is a 9 per cent. grade, the pavement laid in the spring of 1901 was not worn along the gutter stones, and it was observed that horses pulling heavy loads ascended the grade with ease.

Other Boston streets visited showed excellent wearing qualities. The South Boston district proved no exception, and the pavements examined were apparently firm and hard and unaffected by wear or weather conditions. Work was in progress on the Dorchester

street pavement, and as illustrative of the solidity of the material, a block was cut from the newly laid surface and submitted for the committee's inspection. In other sections practically the same conditions were observed, the bitulithic pavements being invariably smooth and hard and presenting a sure footing for horses.

The first bitulithic pavement laid in the country, in 1901, was inspected in Pawtucket. Here there is a 12 per cent. grade; yet horses experience no difficulty, the pavement being well-laid and in good condition, although no money has yet been spent for repairs. The sheet asphalt on Main street was replaced by bitulithic in 1904. This street is subjected continually to heavy traffic, and a fourteen-horse team, drawing four girders weighing twenty tons, recently passed over the surface without affecting it in any way.

The Baltimore party included two members of the Board of Commissioners for opening streets, the City Engineer and the Chief Engineer of the Topographical Survey.



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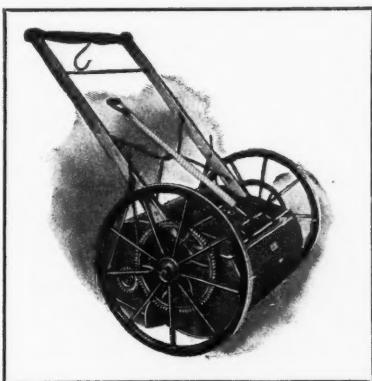
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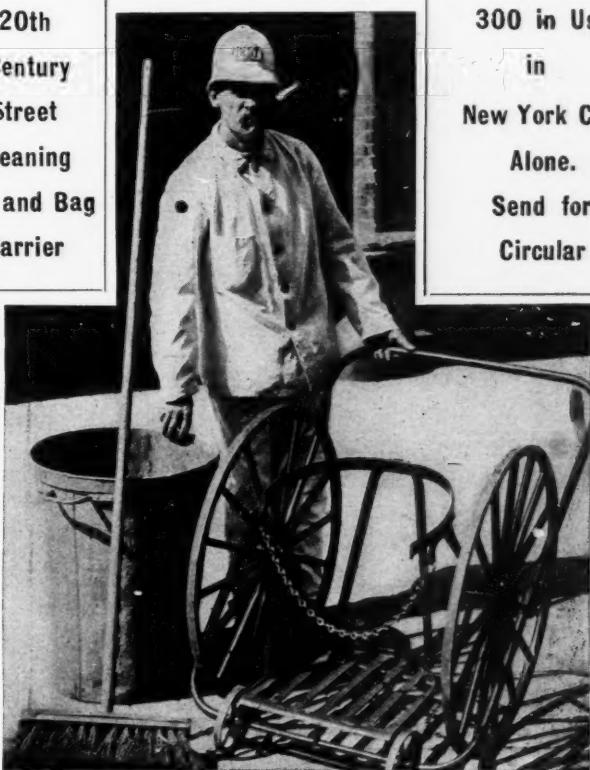
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The Advantages of the Meter System

THE literature of the Hersey Manufacturing Company, of South Boston, Mass., has been drawn upon, on several occasions, for use in these columns, and we now learn that the small pamphlets, such as "Who lays the dust," and "A few words about meter boxes," are parts of a series which this enterprising firm of meter manufacturers sends out monthly in succession. The June example, which has recently come under our notice, contains extracts from an address by William R. Hill, M. Am. Soc. C. E., delivered before the American Water-Works Association at West Baden, Ind., last May, in which it was shown that "in one hundred cities in the United States, having an aggregate population of eleven millions in the year 1901, the average consumption of water per day was . . . equivalent to 132½ gallons per capita."

The views of the same authority in regard to the utility of meters in preventing this excessive consumption and in other ways promoting common-sense administration of a great public utility, can be gathered from the following extract from a paper read by him at the National Convention on Municipal Ownership and Public Franchises, held in New York City in February, 1903: "The great advantages derived from the use of meters are no longer questions of doubt. It has been fully demonstrated by many object lessons

that their use will produce the following results: They will prevent money from being expended in procuring, pumping, and distributing a large quantity of water, the greater part of which is frequently allowed to run to waste. They will insure cheaper water rates to the public generally. They will establish an equitable basis for the assessment of water charges. In some instances they will decrease the quantity of water to be filtered, thereby increasing the efficiency of the filtering plants and improving the quality of the water. They will increase the pressure on the distributing system, thus bettering the protection against fire; and they will in many cases, where water is furnished at fixed rates, eliminate the necessity of increasing the supply or enlarging the works."

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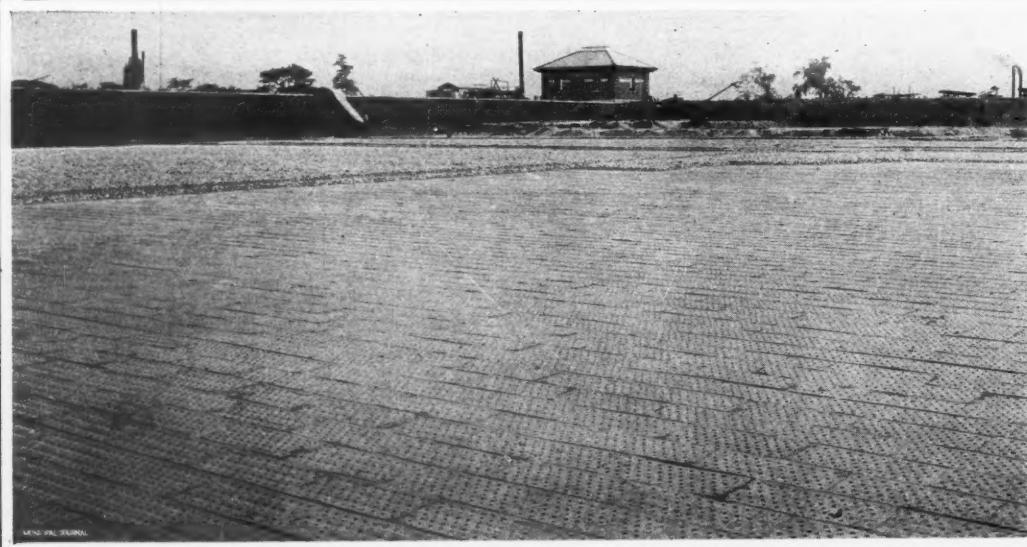
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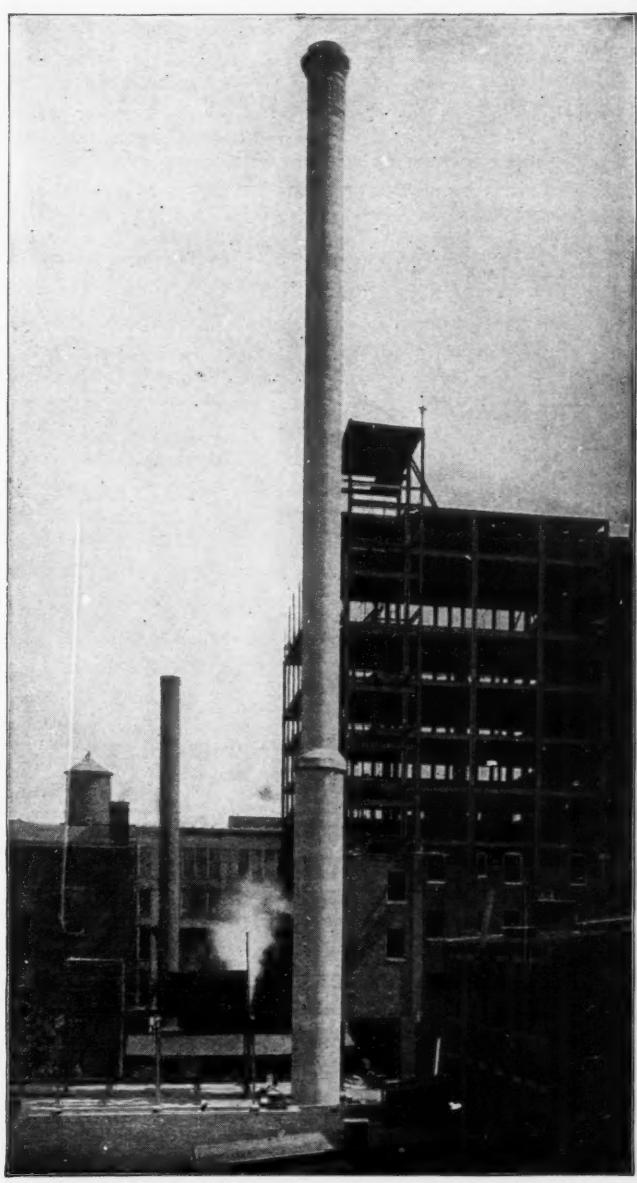
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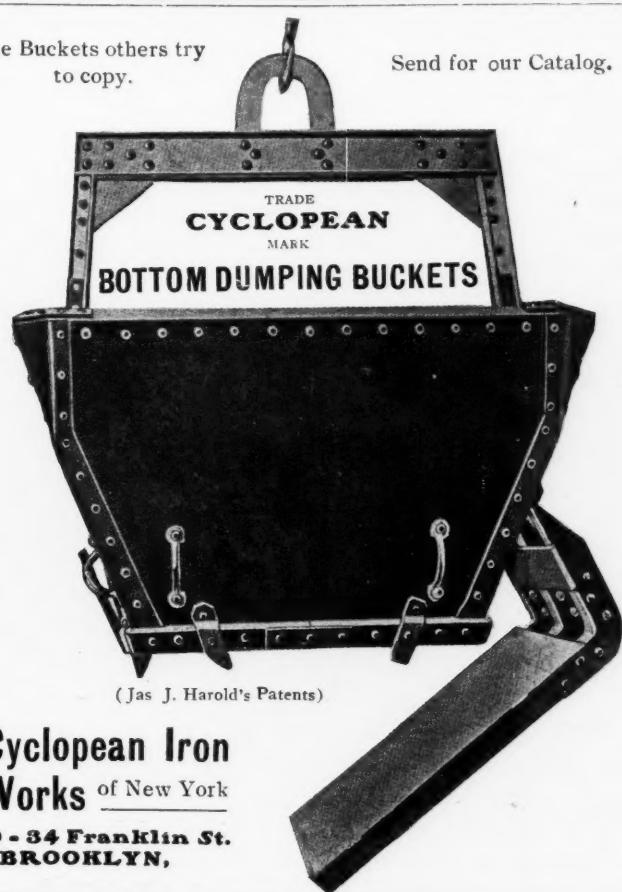


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Chapter II

Hints For Street Builders

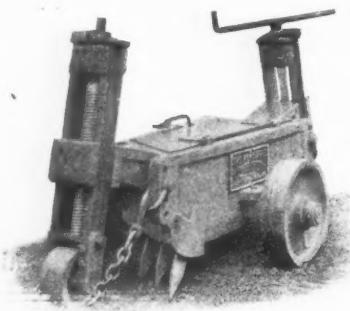
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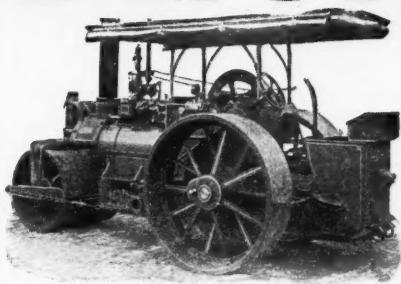
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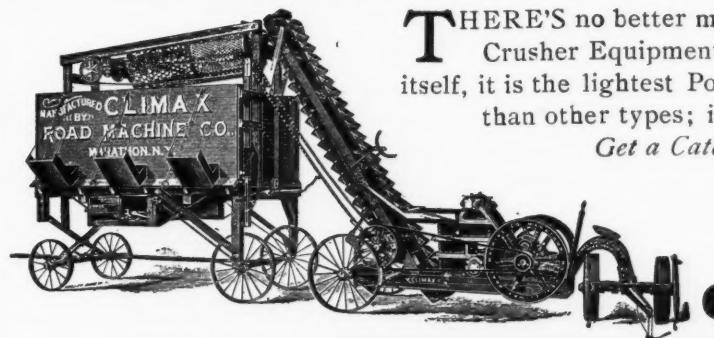
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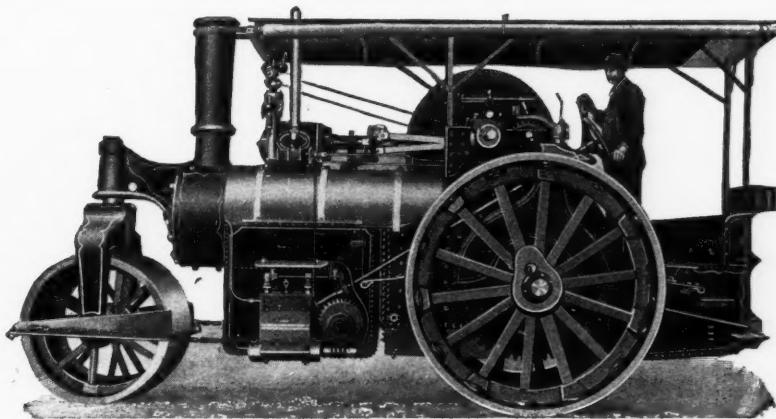
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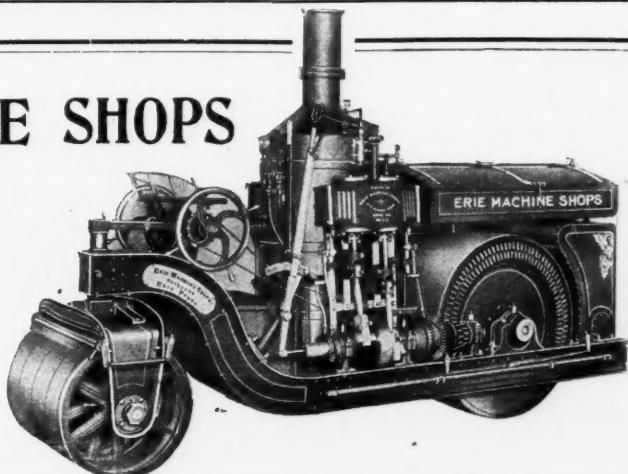
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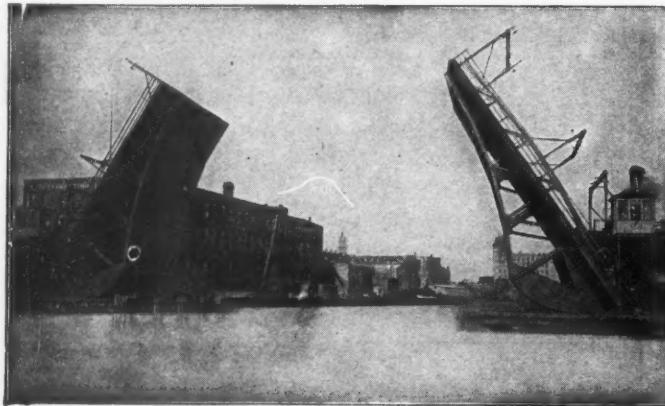
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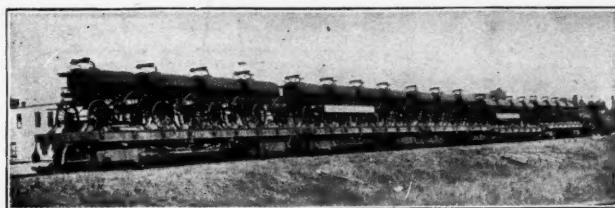
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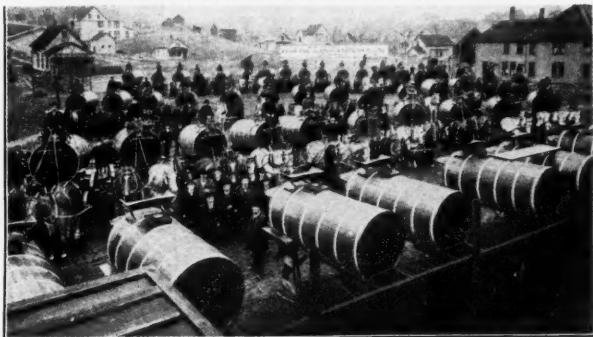
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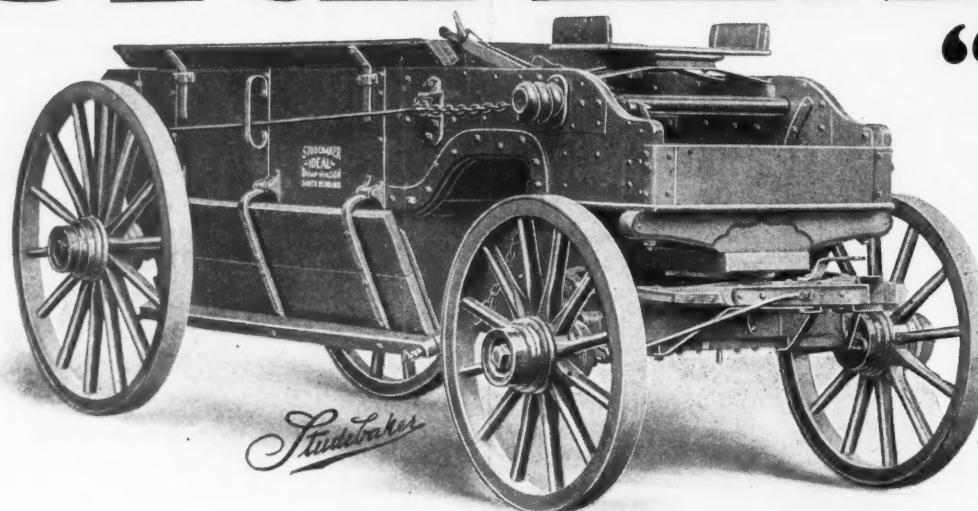
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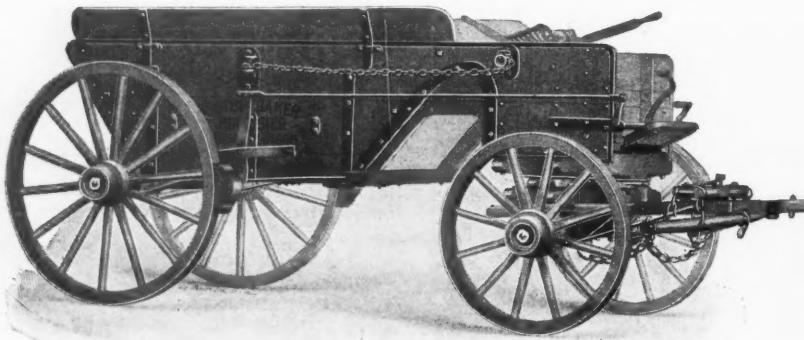
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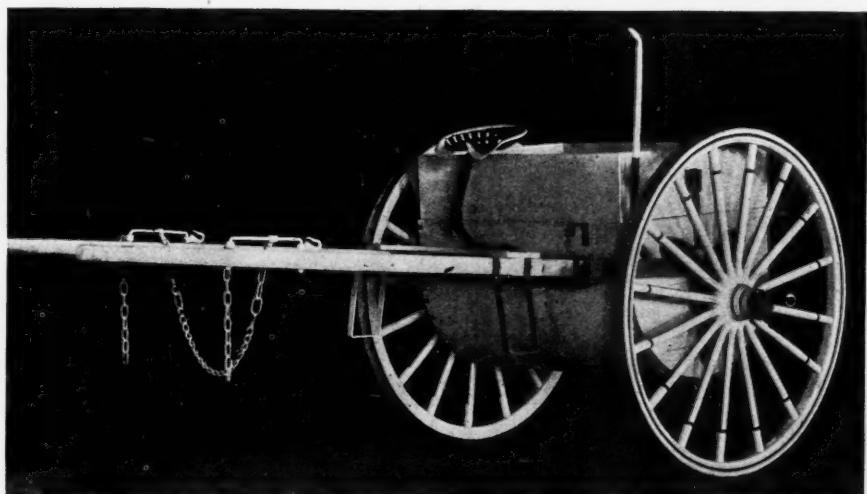
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STUDEBAKER WAGON AN INFRINGEMENT AUSTIN PATENTS SUSTAINED

We have just obtained a final decree in UNITED STATES CIRCUIT COURT OF THE NORTHERN DISTRICT OF ILLINOIS, against STUDEBAKER BROS. MANUFACTURING COMPANY OF SOUTH BEND, INDIANA, finding infringement of our patent No. 532,785, dated January 22, 1895, on DUMP WAGONS, and awarding us a perpetual injunction against the further infringement by making, using or selling such infringing wagons.

The defendants were given an opportunity of protecting the purchasers of their infringing wagons by settling with us for each such wagon sold, but their having failed to do so, leaves us no recourse except against the owners and users of such wagons.

WE HEREBY NOTIFY ALL USERS OF STUDEBAKER DUMP WAGONS having bottom boards suspended by chains, as in the Austin Dump Wagon, that unless the use of such wagons is immediately discontinued, or the right to continue use is procured from us, we shall take the proper legal steps to stop such use, or collect damages therefor in accordance with our rights established by the decree just awarded us.

Here is part of the decree:

"Fourth—IT IS FURTHER ORDERED, ADJUDGED AND DECREED, that a writ of Injunction issue out of, and under, the seal of this Court, directed to the said Studebaker Brothers Manufacturing Company, and its agents, attorneys, servants and workmen, enjoining and restraining them from the further infringement of said Letters Patent.

"Fifth—IT IS FURTHER ORDERED, ADJUDGED AND DECREED, that the defendant, the Studebaker Brothers Manufacturing Company, pay the costs herein to be taxed and that the complainant have execution therefor."

Other manufacturers are trying to pirate our patents, and WE SHALL IMMEDIATELY CALL THEM TO ACCOUNT, as we have the Studebaker Brothers Manufacturing Company. The safest and best way is to buy only the reliable and time-tried "Austin" and avoid trouble.

AUSTIN MANUFACTURING COMPANY, CHICAGO.

BOOKS FOR Municipal Officials, Engineers and Contractors

See page 58 of this issue

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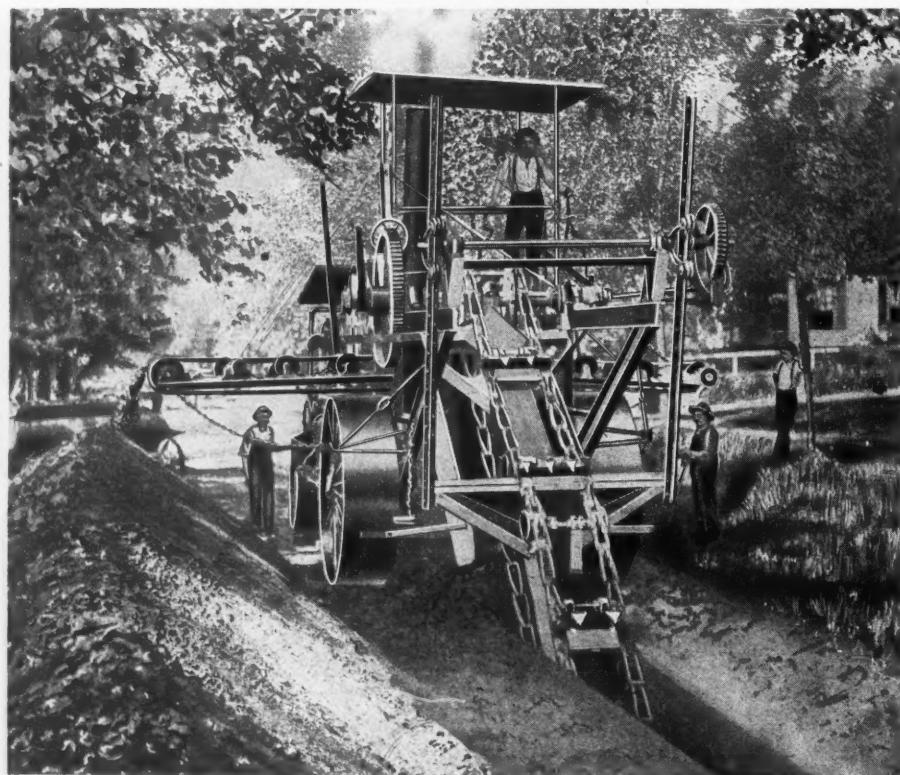
Hitherto we have leased our Excavators for doing the excavation on one contract at a time only, thereby giving us an opportunity to perfect the machines, and the contractor an opportunity to test their merits, until to-day they are considered *practically perfect*.

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To contractors already in the business, or to men seeking a lucrative business venture, it would be difficult to conceive of a business proposition promising as large returns with the investment so well guarded as in this instance. *It is a proposition where the contractor cannot help making money if reasonable business acumen is used.*

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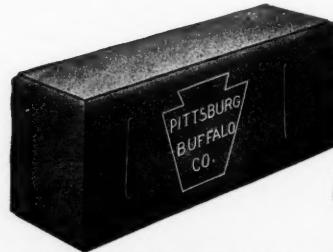


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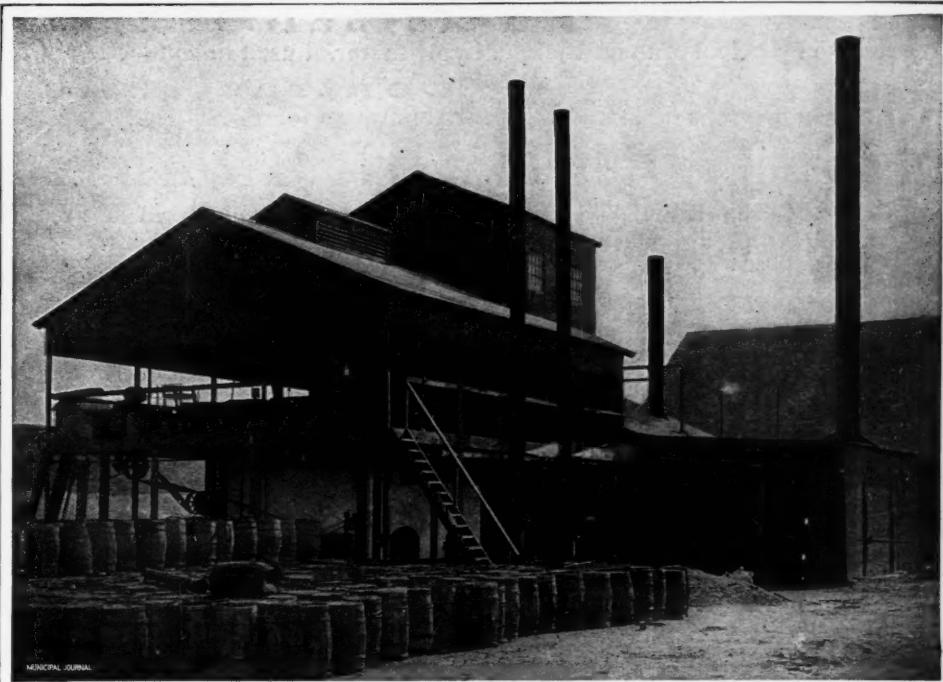
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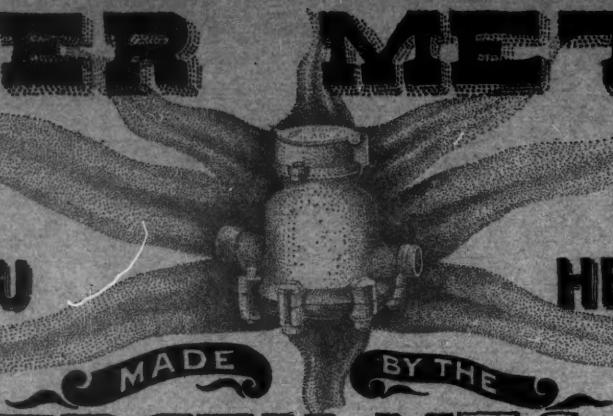
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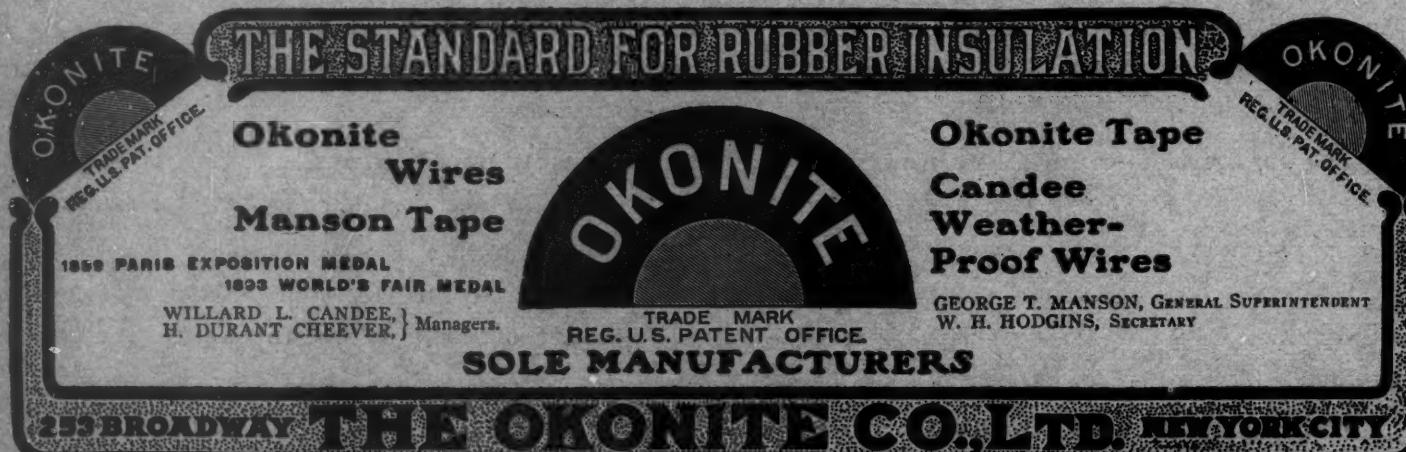
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